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Agricultural Mechanisation

WORLD CROPS

UNIVERSITY OF MICHIGAN

The International Journal of Agriculture

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VOLUME 9, No. 10 OCTOBER 1957

A Publication of The Leonard Hill Technical Group

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Vol. 9, No. 10 — OCTOBER 1957

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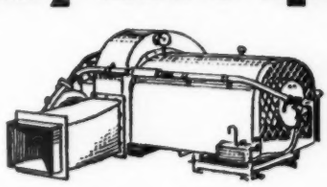

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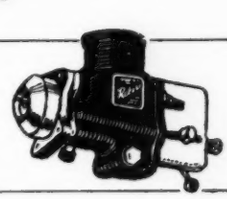

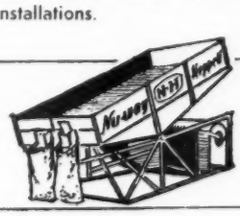

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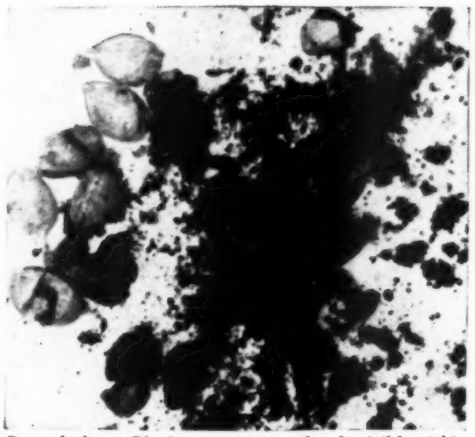

Bunted wheat. Black spore masses clearly visible within the grain.

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WHEAT	Bunt	**MAIZE**	Dry rot
BARLEY	Covered smut · Leaf stripe · Net blotch	**SORGHUM**	Kernel smut Leaf spot
RYE	Bunt · Stripe smut	**GROUND-NUTS**	Black rot Foot rot
OATS	Covered & loose smuts Leaf stripe	**JUTE**	Stem rot
RICE	Foot rot · Leaf spot	**SUGAR BEET**	Black leg

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Editorial Comment

The machine age

TRAINED BRAINPOWER is one of the most urgent problems of today, but are our legislators equipped to understand—let alone to cope with, and to control—the effects of a rapidly advancing technology on the well-being of the country? The cult of classics dies hard.

It is true that an unwieldy Parliamentary and Scientific Committee, which at present has a membership of 175, consisting of peers, M.P.s and representatives of scientific institutions, has been instrumental in promoting the Government's £80 million scheme for improved technical education facilities, but it may be stated that this belated and inadequate effort was primarily due to the unanimous outcry in the technical and popular press for a solution of the urgent problem of maintaining a satisfactory supply of trained technicians.

Research in the field of agriculture and in the development of agricultural machinery has proved so profitable that in an ever-expanding world economy, any shortcoming, due to lack of trained men, would be disastrous. There appears to be no finality in any field of development; on the contrary, new problems are constantly arising and new sciences are being developed, and the need will be for more men and still more men to meet the needs of agriculture and its related industries, and of research and technical education in its broad sense.

With ever-increasing mechanisation, farms now produce a valuable surplus, more important than their arable or dairy products. They produce a surplus of young people. These men and women, familiar with life and work in the country, are needed by agricultural industries to develop, test and introduce new machines to the farmer. They are also needed to do research, and to teach, to advise and to administer agriculture both at home and overseas. They should not be lost to agriculture as their instincts, knowledge and experience are all urgently required. The need to decentralise technical education into the rural areas is therefore obvious.

Silent devastation

THE GROWING awareness of the need to conserve material resources is one of the most heartening features of the contemporary industrial scene. The far-seeing technologist and manufacturer no longer think in terms of inexhaustible natural resources.

An important example of this new attitude is the attention now paid to the prevention of corrosion. The anti-corrosion armoury now boasts a versatile range of weapons (see article on page 406). The pressing need is to get people to use them. For over three years, with mounting success, *Corrosion Technology* has been preaching the gospel of corrosion prevention. Now these efforts are to be augmented by a Corrosion Exhibition and Convention. During National Anti-Corrosion Week, from 14 to 18 October, which is being sponsored by the Leonard Hill Organisation, an exhibition of anti-corrosion methods, materials and equipment will be held at the Royal Horticultural Society's Old Hall, Westminster, on 15, 16 and 17 October.

By focusing national, and indeed international, attention on corrosion in this way, it is felt that industry will be persuaded to look at the problem as a whole. It will be an occasion for every managing director and every works manager, every planter and every farmer to assess their corrosion problems and the steps they can take to solve them. A number of distinguished speakers have promised to deliver papers at the convention, the broad theme of which will be the economic and technical consequences of corrosion and the methods and materials for prevention. The prime aim is to focus attention on the costly evil of corrosion in order that still more is done to conserve the raw material resources of the world.

The N.I.A.E.

ORIGINALLY FOUNDED as a department of Oxford University and for a time administered as a branch of the Ministry of Agriculture, the Institute is now state-aided and under the control of the Agricultural Research Council, the British Society for Research in Agricultural Engineering being responsible for its administration. The staff of the National Institute of Agricultural Engineering numbers about 300, of which approximately 90 are graded as scientific and experimental staff, being mostly engineers, agriculturists or horticulturists, together with some physicists and chemists. The work of the Institute covers all aspects of agricultural and horticultural mechanisation, and briefly its functions comprise research and development on new machinery and farm equipment, carrying out impartial tests for manufacturers, and serving as a centre for information on all aspects of agricultural engineering (see WORLD CROPS, **1**, 298 and **8**, 482).

The Institute is situated at Wrest Hall, Silsoe, near Luton—one of England's stately homes, which in itself is well worth a visit by overseas visitors. It was decided upon chiefly because of its central position,

relative to an important agricultural and horticultural area, and its proximity to a wide range of soil types. The estate covers some 300 acres, but only 90 of these are under crops, which are grown solely for experimental and testing purposes; horticultural experiments are carried out in the extensive greenhouses, in the walled gardens and in the park; and the remainder of this lovely estate is kept in a fine state, because of its architectural and landscape features.

A liaison service is maintained through the local officers of the N.A.A.S. who receive the inquiries from farmers, and in addition the Institute arranges refresher courses to enable the machinery advisers of the N.A.A.S. to keep up to date with new developments in agricultural machinery and with the progress of research at the Institute. The Institute is also open to receive visitors from overseas, by appointment, on Tuesday and Thursday afternoons; there are also special demonstrations and exhibitions on 'open' days, which are arranged from time to time.

We consider that the Institute is performing a much-needed service and that its utility is bound to increase as the years go by. In many ways it is unique and it is to be specially noted by our readers that its services can be made available not only to people in the U.K., but through appropriate channels to agriculturists overseas.

Spicy news

CONSIDERABLE EFFORTS are being made in India to develop and expand the production of spices which have always been traditionally associated with that country. Research is now in progress both into the well-known spices like pepper, ginger, cloves and nutmeg and lesser-known crops such as cardamom and turmeric.

Total ginger production in the 1955–56 season amounted to some 14,000 tons from 35,400 acres. Of this total, about 2,800 tons were exported, compared with 2,000 tons in 1948. Research into ginger production is proceeding at the Agricultural Research Station, Malabar, and also at the Ginger Research Station in Assam. The most urgent problem is to improve the quality of the ginger crop by evolving a fibre-free product through breeding and selection. Different ginger varieties, cultural and manurial practices, storage and curing of ginger and the control of pests and disease are also under investigation.

A scheme for research into cloves and nutmeg is in operation at research stations in Madras State. This scheme includes investigations into the selection and propagation of high-yielding trees, cultural and plantation practices. It is intended to use the improved planting material so obtained for distribution to prospective growers.

Plans are also in hand for the establishment of two cardamom research stations, in Travancore and Mysore respectively. They will conduct trials with different varieties and investigations of cultural methods with a view to improving the yield and quality of cardamom. The area under cardamom at present is about 120,000 acres and production is 2,250 tons, shared between the States of Mysore, Kerala and Madras. Exports in 1954–55 amounted to 894 tons.

The present production of turmeric amounts to about 121,210 tons from an area of 142,455 acres. Research into this crop is in operation at a station in Andhra State.

Strings to strangle

IT IS reported that the Russian Government is to plant 30,000 acres in Ceylon with rubber, on condition that the crop will be sold only to Russia and at an agreed price. It is not stated whether this offer is to take the form of financial aid or a loan to subsidise the planting, or whether Russia is to supply experts and supervisory staff, as well as field and factory equipment.

According to the report (*Daily Telegraph*, 6 August), the Ceylon Government is very sharply divided on the issue, and this is only to be expected in view of the national policy gradually to eliminate alien influences. The fact is Russia is able to obtain all the rubber she requires at the prevailing market price and is getting her supplies, principally from Malaya and Indonesia.

Her real purpose is strategic. It will be news to most of our readers that Russia has recently established a quite unnecessary Embassy in Colombo with a staff of 240 and that it is even proposed to set up branch offices in Kandy and Galle. Simultaneously, Ceylon has appointed an Ambassador to Russia in the person of Dr. G. P. Malasekera, O.B.E., through whom the present offer is being negotiated.

In much the same way, before the last war the far-seeing Japanese established a flourishing hemp industry in the country round the fine deep-water port of Davao in Mindanao, which lies halfway between Japan and Australia. In 1934, there was a pocket of 3,000 farmers in this area about whom very little was known in Manila. It will be recalled that in 1945 the Americans very wisely by-passed this strong-point and landed instead at Leyte.

Britain is giving up her bases in Ceylon in October. Since the war, Britain has given freedom and nationhood to at least 500 million of the peoples of Asia and Africa. In the same period, Russia has absorbed 100 million of the peoples of Europe into her new empire and now she is turning her attention to the millions of Asia and Africa. Today in India, there is 'disorder with a purpose' (*Daily Telegraph*, 10 August) and a calculated campaign of violence has broken out in the Communist-governed state of Kerala in South India,

and 'as each month passes the opportunity for the Central Government to intervene declines'.

Our Indian, Ceylonese and Malayan readers, who value their newly-won independence, are invited to re-read our previous editorial (WORLD CROPS, **9**, 223), to pause and consider the significance of the arrival of Soviet technical experts in Ceylon and to remember the fate of Hungary. This is not simply technical aid given in the spirit of international fellowship. It is rather the first foot in the partly opened door, leading to a new colonialism for Asia far less benevolent and constructive than the chapter now ended.

The danger is very real and very close.

Aid without strings

WE HAVE just received a report on a brilliant piece of research which has been carried out by an Australian agronomist* who has been loaned by the C.S.I.R.O. to Ceylon under the Colombo Plan.

His primary purpose was to determine the nutrient status of selected soils, typical of comparatively large areas, with a view to the more effective and economical use of fertilisers on coconuts and the correction of nutrient deficiencies that might be a limiting factor in the growth and selection of desirable pasture plants that could be grown on coconut estates to feed dairy cattle and thus provide subsidiary sources of income.

The investigation used the technique of bio-assay, otherwise known as the pot technique, whereby species of plants known to require soils of high fertility are grown in pots without mineral nutrients, and with all possible combinations of nutrients, and their effect is measured in terms of the yield (dry weight) of plants in every pot. The test plants used were perennial pasture grasses and legumes, as it is, of course, quite impossible to carry out pot trials with large coconut plants, except on a limited scale, and over a long period of years, and even then the results could not be either sufficiently comprehensive or conclusive.

While obviously all plants do not require the same nutrients in the same proportions, these experiments will give a general picture of local soil fertility problems, for it is highly probable that, if a rapidly growing plant with high fertility requirements shows no deficiency of any nutrient, then that nutrient is unlikely to be a limiting factor in the growth of coconuts, or for that matter other commercial crops.

The plants were grown in several hundred 'Polysterene' pots in a special phytosolarium, a building 20 ft. x 60 ft., made with an aluminium framework and covered with an envelope of 'Cascalite'. The sides of the building were hinged to allow free ventilation; the light was diffuse and even. The plastic pots were carried on wheeled tables and the orientation of these tables was systematically varied.

All the pots were watered daily to 85% field capacity, and the water used was filtered, passed through a water softener and distilled and redistilled before use. The final distillation was in Pyrex glass. In all, ten of the most essential plant nutrients were used in the form of pure chemicals applied in various combinations.

It is not possible here to give the results in full and the reader is recommended to read the report *in extenso*. In the first instance, a *typical* lateritic gravel on which coconuts are grown has been studied and the data show that this soil was deficient in nitrogen, phosphate and potash, and in addition there was a deficiency of calcium. There was no apparent deficiency of magnesium of sulphur or of the trace elements—copper, zinc, manganese, iron and boron. Molybdenum had no apparent effect, but the delayed effect of this element on symbiotic legume bacteria needs further investigation, according to the authors. Nitrogen was found to be at all times an important limiting factor in plant growth. A deficiency of potash in this soil was established and the data suggested that available potash in the soil is gradually fixed. The capacity of this soil to fix available potash is, however, limited.

The work will now be extended to other soil types by the local officer who has been specially trained to carry on these investigations with the equipment that has been provided and on the lines laid down by the Colombo Plan expert. It is certain that there will be important conclusions to be reached after a similar thorough examination of the less fertile coconut soils.

Other Technical Aid

IN A world where there is a lot of prejudice, often ill-founded, against officials in general and the operations of large organisations, it is good to read of the achievements of technical assistance teams in different parts of the world. The U.N. Expanded Programme of Technical Assistance has now been operating for seven years and the Technical Assistance Board has published in its Annual Report for 1956 an evaluation of the work carried out in various fields.

In the agricultural field the achievements have certainly been impressive, as the following few examples will show:—

In *Brazil*, a 12-man team has been assisting the Government to chart the forestry, mineral and fishing resources of the Amazon and to show how they could be developed. Mapping of forestry resources in the region of the Rivers Tapajoz and Xingu has been completed, and in about two years the whole right bank of the River Amazon will have been chartered for the first time in history.

In *Colombia*, the recommendation of the two experts

* T. B. Paltridge and K. Santhirasgaram—'Studies on the Nutrient Status of some Coconut Soils in Ceylon', Bulletin No. 11 of the Coconut Research Institute of Ceylon.

engaged in finding new sources of water and digging wells in the arid Guajira Peninsula resulted in substantial savings in the development of the water resources of the country.

In *India*, in the hilly areas of the State of Uttar Pradesh, where horticulture offers most economic promise, international experts assisted in establishing a research station with 17 mobile units, consisting of gardeners and plant protectionists. The yield of orchard crops has increased substantially, and the peach crop alone has gone up from 1,200,000 lb. in 1953 to nearly 3,000,000 in 1956, thus making it possible to establish a fruit-packing industry.

As a result of the services rendered by international experts since 1953, rice production in *Egypt* has increased steadily until, in the last two years, it became an export commodity ranking second only to cotton.

In *Pakistan* the demand for trained operators and mechanics is being successfully met by the Government's Earth Moving School, set up with the assistance of the I.L.O. The school is training young Pakistanis to handle, repair and maintain heavy equipment such as tractors, excavators, bulldozers and dredgers.

By the beginning of 1957, 150 miles of irrigation and 50 miles of drainage canals had been completed with the assistance of FAO specialists. Government expenditure to date amounts to some $4 million, while the U.S. International Co-operation Administration and the Colombo Plan have provided equipment and construction work amounting to approximately $2 million.

. . . *and self-help*

FOLLOWING THE recommendations of the Tea, Rubber and Coconut Research Institutes of Ceylon, an enterprising Ceylonese firm has opened a factory for the production of ground dolomite, of which there are extensive deposits in the Matale district, near Kandy.

Dolomite is a hard mineral—a double carbonate of lime and magnesium ($CaCO_3$: 54%; $MgCO_3$: 46%)—which occurs in crystalline or granular masses and may be either white or else coloured with trace mineral impurities. Dolomite is both harder and denser than limestone, and special machinery, for crushing and grinding it, is required to reduce it to the required degree of fineness (10 mesh) for agricultural application as a slow-acting fertiliser and soil conditioner.

Calcium and magnesium have been described as the fourth and fifth elements of plant nutrition; magnesium enters into the composition of chlorophyll, and the effect of adding it to a soil deficient in this element is to improve the colour of the foliage and the vigour of the plant. Lime is commonly deficient in sandy soils and in those soils which, owing to an excess of organic matter, are sour and acid.

The recommendations are as follows: for tea, growing in acid soils—5 cwt. per acre; for young rubber, growing on soils deficient in magnesium—½ lb. per tree during the first year, 1½ lb. during the third year, and 3 lb. during the fifth year; and for young seedling coconuts, growing on soils which are deficient in both these elements, 2 lb. per palm sprinkled in the planting hole. Dolomite is also recommended for cocoa and tobacco if the soil is deficient in these nutrients.

Progress in world agriculture

THE LATEST volume of FAO's annual 'Yearbook of Food and Agricultural Statistics' notes that in 1937, 1,346 million persons, or 63% of the total world population, were dependent on agriculture. By 1950 the figure had dropped to 59%, with 1,477 million out of a total of 2,504 million people.

This downward trend was more than compensated by an upward move in productivity. Agricultural production per head of world population in the period 1948–49 to 1952–53 was only 96% of pre-war *per capita* production, but increased to 104% of pre-war by 1955–56. The regional increases from the 1948–49 to 1952–53 average were considerable in Western Europe, where *per capita* production in percent of pre-war moved from 97 to 109. There were lesser rises in the Near East, where the percentage figures rose from 99 to 107, the Far East from 86 to 92, and Africa from 104 to 110. And there were small rises in Oceania, 94 to 97%, in Latin America 90 to 91%, and in the U.S.A. 115 to 117%.

Some of the statistics given indicate some reasons for increased cultivated acreages and increased yields. No total world figure is given, but the available statistics show a big increase in the irrigation of farmlands. In Bulgaria, for instance, there were 250,000 ha. of land under irrigation in 1953; in 1955 the area had risen to 360,000 ha. In Jamaica, the irrigated area rose from 17,300 ha. in 1951 to 21,000 in 1955; in Argentina from 1 million ha. in 1952 to 1.45 million in 1954; in Uruguay from 16,000 in 1951 to 23,000 in 1954; in the Philippines from 563,000 ha. in 1951 to 766,000 in 1954; and in Australia from 612,000 ha. in 1951 to 704,000 in 1955.

There was also a marked trend from muscles to machines. The total number of tractors used in agriculture (excluding the U.S.S.R.) rose from 5,723,000 in 1949–52 to 7,718,000 in 1955. In many European countries the number was doubled. In Austria, for example, they rose from 16,810 to 50,144; in Belgium from 12,000 to 24,500; in France from 148,142 to 300,000; and in North and Central America the total figure rose from 4,208,000 to 5,030,000. The increase was also strong in the less-developed countries. The total figure for South America rose from 93,000 to 165,000, and in Asia there were 76,000 tractors in use in 1955, against 39,000 in 1949–52; Africa had 168,000 against 102,000, and Oceania 271,000 against 176,000.

RESISTANCE TO MECHANISATION

Agricultural mechanisation is penetrating into more and more parts of the world, and wherever it makes its appearance, better living conditions follow. In countries where mechanisation has long been established, the early struggles and prejudices tend to be forgotten. In others, there is still considerable resistance, which, as this article shows, takes many forms.

A PRIMITIVE man, hearing an engine start for the first time may flee into the bush with a loud cry of 'witchcraft!' Another, more educated, may be unable to drive a tractor because his traditional mode of dress hampers his use of the controls. Political difficulties may prevent the issue of the necessary import licences.

In other words, wherever a machine settles in to its work lies the story of somebody's initiative in overcoming resistance to the new concept of farming.

Obstacles to progress

The first, and most definite hurdle is topographical. Obviously, some areas cannot be mechanised at all. The land may be too steep for machines, or it may be so wet that nothing can move across it. Certain rice fields in delta areas show this condition, for the flooded land is a bog of silt. Indeed, in some areas, the crop has to be harvested from boats.

Again, small native holdings may be surrounded by forests so vast and so impenetrable that machinery cannot be moved in. At the time of writing however, even such considerations as this are being waived. It is now possible to use helicopters to drop tractors and farm tools into the middle of towering jungles. In a recent operation of this nature, the most remarkable results were achieved. A team of three helicopters took off at 9 a.m. one morning and flew a shuttle service into the middle of the jungle. They carried mixed loads of tractor and implement parts. By three o'clock in the afternoon of the same day a tractor and its equipment was at work on the site clearing and preparing land for a new colonisation scheme.

Indeed, the conquest of geographical conditions by machines is an inspiring subject. Tractors and implements are now in use in all parts of the world, from the scorching heat of the tropics to the frozen deserts of the antarctic. Only in isolated cases does nature place an unflinching ban on the use of such tools.

The Luddites* of agriculture

The next type of resistance is by far the most colourful and amusing, for it embraces all the curious ramifications of human psychology. As in the pioneering days of industrial machinery, men frequently regard the farm machine as a direct threat to their livelihood. In certain areas, stories of machines being sabotaged may be found even today.

Most advanced countries have now passed through their period of teething troubles. The suspicious school of thought has wilted. Men no longer condemn the pneumatic tyre by saying that 'something' comes out of the rubber and spoils the land. Suspicion finally died away when the benevolent giant of the harvest field, the self-propelled combine, was finally accepted as a true friend by townsman and countryman alike.

Ignorance and fear

In primitive areas, however, the picture still remains dark. A tractor may still be regarded as a monster in which imprisoned spirits roar out their evil intentions against the world. It may develop a mind of its own and carry its quaking driver into the nearest river. Yet the prospect is encouraging. A farmer may not grasp fully the workings of his engine, saying blithely, 'this tractor he sing', as the engine screams for oil, but at least he has overcome his fear of the unknown, and from that stage onward the road is easier for everyone.

A degree of education, in fact, solves many problems. Realising this, the most forward-looking manufacturers go to great pains to ensure that prospective owners understand fully the working of their machines. The large-scale school at Stoneleigh, operated in Warwickshire, England, by

A family conference—the continual subdivision of land between father and sons produces small plots of land unsuitable for mechanisation

* Luddites: In 1811, masked men broke into a lace factory in Nottingham, England, and broke up new machines which they thought were a threat to their livelihood.

Starvation and poverty prevent the spread of mechanisation into areas where it is most needed

(Below) *Religious influences forbid the killing of this animal. It must live out its useless life acting as a drag on its owner's prosperity*

Massey-Harris-Ferguson, is a good example of such an enterprise. *Once a man understands his machine, he gains confidence.* Moreover, he has the knowledge to farm his land well, and avoid mistakes which can lead him to disaster.

Land fragmentation

Having passed the barriers of ignorance and fear, outmoded social systems have to be studied. The continual subdivision of land as it is passed down from father to son has in many cases produced small scattered plots. They may be of such minute proportions that they cannot be worked economically by machine. Traditions of this type are difficult to overcome. and in fact call for a social revolution. Old-established and overcrowded countries such as India show good examples of this type of problem. *Crippled by rigid systems of land tenure, vast numbers of people live on the starvation line.* They can never hope to feed themselves adequately without a tremendous upheaval. Yet such a change must be effected with the utmost care and tact, or a highly inflammable situation could arise.

There are signs that a quiet revolution is taking place. Reports filter through of whole villages starting co-operative schemes to redistribute land on a fresh pattern. Larger projects are also envisaged. Admittedly, some time will elapse before the whole subcontinent begins to stir and pulse with new life, but it is always better that such powerful influences should begin on a small scale. Where the new systems are applied, machinery can move in. *Improved food production brings its normal increase in well-being, and the outlook is considerably better now than it was a few years ago.*

Yet, even where such changes are taking place, other influences may remain static. Cheap labour, which must be employed, always presents a problem. It is not enough to produce food by mechanical means if, by doing so, people are thrown out of work. Side by side with agricultural progress must come the development of other industries in which the displaced workers can be found a new occupation. Here, government backing to a major scheme is essential. If such assistance is not forthcoming the agricultural development will be retarded.

Religion and tradition

Religion also makes its impact on the order of events. In certain countries, for example, the cow is regarded as sacred. Old, useless animals must therefore be allowed to linger on until they die of natural causes. They occupy considerable areas of valuable land and greatly retard the progress of farming. But where the religious beliefs of a whole nation may be at stake, the situation must be handled with the greatest possible delicacy. It may be a generation or more before deep-seated ideas become modified, and *authorities, in their zeal for land improvement, must await future developments with patience and understanding.* Without doubt the changes will come, but they will take time. The beliefs of thousands of years' standing cannot be uprooted suddenly.

Old customs and other traditions sometimes lead to lack of money. Unless a farmer is prepared to open his mind and work his holding well, he will never be able to afford the machines which can be his salvation. *New equipment cannot always fit into an old-fashioned framework.*

Financial resistance

In certain instances again, wealth may be concentrated in the hands of a few people who deliberately keep the majority in poverty in order to meet their own ends. Such a system is bound to lead to serious repercussions on the financial health of the community, for a state where farming is starved of money can never be self-supporting in a crisis. While revenue is available from other quarters, all goes well; if the source of revenue dries up, the country starves.

It is in these areas, therefore, that financial resistance to farm mechanisa-

Extreme examples of agricultural mechanisation

(Left) *A Massey-Harris-Ferguson combine harvesting sorghum in Rhodesia*

(Below) *A Massey-Harris Ferguson 4-row planter with fertiliser attachments for corn or cotton, operating in South Africa*

tion is at its strongest. The farmers are forced to live at the level of peasants, scraping a miserable living from the ground by methods which have been followed since biblical times, and little can be done to ease their lot.

A political barrier

In this way the focus moves into the realm of politics. In fact *political differences can be a serious barrier to progress when trying to overcome resistance to farm machinery*. Everything else may be in order. A country may be rich, with healthy and flourishing agriculture and a well-planned social system. The people may be educated and in a position where they would welcome the influx of machines on the land. Every facility may be available for adequate servicing and educational work. Yet a political barrier may prove insuperable, and nullify the efforts of everyone who is trying to help the farmers. The imposition of import tariffs is only one of the tools that may be called into play by an opposing government.

It is noticeable, nevertheless, that in most parts of the world where political issues are raised, progress is being made. Once farm machinery can get a foothold in these difficult areas its good reputation does the rest. Time and time again, the entry of a few tractors and other pieces of equipment into a closed country has ensured that larger orders are taken in the following years, until a worth-while trade has been established.

Fitting the crop to the machine

Curiously enough, the question of manipulating the crop appears to come last on the list of important points of resistance. It might be thought that it should come first, and indeed in the early days it did. *For many years it was impossible to mechanise certain crops because their very nature limited the process*. Concurrently, progress was hampered by lack of engineering knowledge. Until techniques reached a certain level, the necessary skill and materials were not available to make many useful machines, although the basic principles might have been worked out two or three centuries before. It is, therefore, the crop itself that forms the final stronghold against advance. A good example is the case of the sugar-cane harvest. Cane is a most objectionable crop to cut. The work has to be done by hand, using razor-sharp machetes, which are a danger to the worker. Mechanical harvesting has been accomplished in certain areas, but the machines, which are huge and clumsy, can only deal so far with the lighter crops.

In the heavy-yielding areas the cane, which is woody and tough, may run along the ground for several feet before rising into the air, and a machine to handle a crop of this nature would have to be so vast and powerful that nobody could possibly afford it.

The botanist is at work, however. By patient and skilful breeding he is able to change the form of the crop so that he can meet the machine designer half way. The day is probably not far off when a high-yielding cane of upright habit will be established, after which the engineers will be able to produce a fairly simple machine to sell on a world-wide scale.

The future outlook

Under his cloak of pessimism, the farmer is, in fact, a profound optimist. It is fortunate for the rest of the world that he is, for otherwise, everyone would starve. Although he provides some of the initial resistance to the use of machinery on his land, his inherent far-sightedness provides one great safeguard to mankind.

There may have been a struggle to get the machines on to the land. But there can be no question of taking them away again. *The farmers would never let them go.* So in spite of transient troubles, world farming, rapidly devolving into the hands of a few highly-skilled specialists, seems to be heading for a healthier era than it has ever known.

RUSTING AND ITS COST TO FARMING

E. E. WHITE

(Technical Secretary, British Iron and Steel Research Association)

A great deal of iron and steel is now used in farming, in the form of buildings, or parts of buildings, and mobile or stationary machinery. As a farmer invests much of his capital out-of-doors, it is imperative that he should prevent depreciation by corrosion as far as possible by providing the maximum and most efficient protection.

IF all the steel produced annually in this country were given two coats of paint, the cost would be about £200 million. In practice only a portion of this output is painted, but, allowing for the cost of maintenance of existing structures, the figure is of the right order of magnitude of the annual cost of rust to Great Britain.

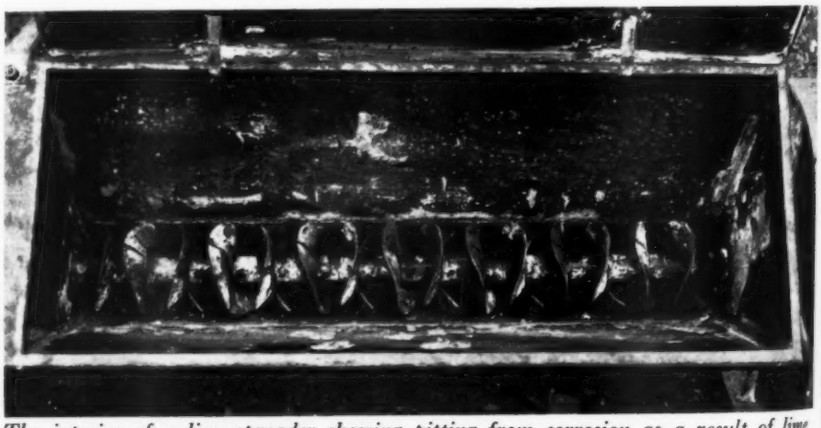
Types of steel

Mild steel is that most commonly used for structures and sheeting. It consists of iron combined with quite small percentages of carbon, silicon, manganese, sulphur and phosphorus. Steels which are mechanically stronger, more ductile, or have higher tensile properties are obtained by adding metals such as copper, chromium and nickel to mild steel, but all kinds of steel can be classed in one of three groups as regards resistance to corrosion: stainless steels, which are virtually incorrodible under many conditions ; low-alloy or ' slow-rusting ' steels ; and ordinary steels, which have no special resistance to rusting. Stainless steel costs about nine times as much as mild steel, and slow-rusting steel about one-and-a-half times as much.

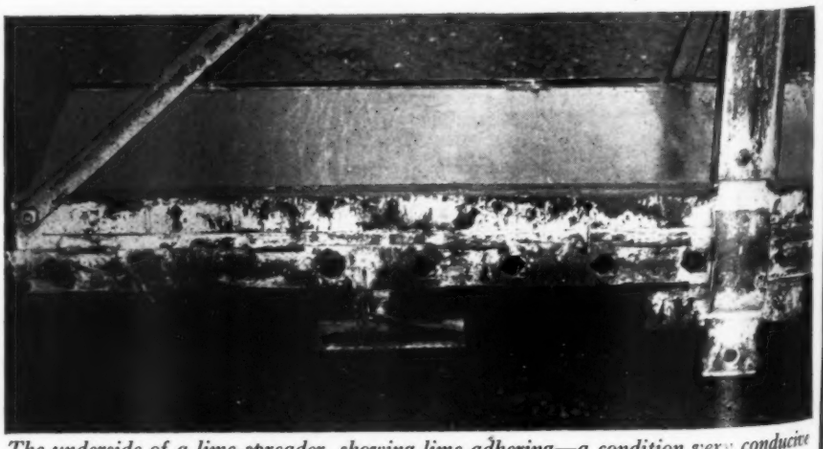
Stainless steels contain high percentages of chromium and nickel and, in some cases, smaller amounts of other metals. The resistance to corrosion of these steels is due to the presence of an extremely thin protective oxide film on the surface. This film is immediately re-formed if the surface is damaged when in free access to air. *If, however, a stainless steel is damaged under conditions where there is lack of oxygen, e.g. in crevices filled with stagnant water, local corrosion or pitting takes place rapidly.*

The high cost of stainless steels debars their use generally on farms, except perhaps for dairy equipment and plant which it is necessary to keep scrupulously clean by sterilising and where no protective coating would be either as efficient or even as suitable as an alternative. One important reason for the use of stainless steel in dairies is that milk always leaves a deposit on metal surfaces. The cleaning methods employed are usually too corrosive for aluminium, tin and other metals. Moreover, stainless steel is preferred to aluminium in churns and milk cans because of its superior mechanical properties.

Slow-rusting steels provide a more practical proposition, especially for structural use and for general purposes outdoors. These steels contain small



The interior of a lime-spreader showing pitting from corrosion as a result of lime adhering



The underside of a lime-spreader, showing lime adhering—a condition very conducive to corrosion

Agricultural machinery under partial cover in an old English barn on a farm near Salisbury

percentages of alloying elements. Although a steel containing 0.3% of copper and 1.0% of chromium will rust, it will do so three to four times more slowly than mild steel. The increased resistance is due to a relatively thick layer of rust instead of the thin oxide film of a stainless steel. This rust, produced by iron and the alloying elements present in the steel, is much less permeable than that on mild steel. The process becomes fully operative only when slow-rusting steels are completely exposed outdoors and when the leaching action of the rain can take place. In other conditions, where this weathering process does not occur, the advantage over mild steel is lost. *Slow-rusting steels do not have any advantage over mild steel when buried or immersed.* The use of this type of steel is most effective in the bodies of wagons and tractors where protection is difficult to achieve and where both abrasion and corrosion occur.

Forms of protection

Although slow-rusting steel lasts longer in the bare condition than does mild steel, each has to be protected whenever possible from corrosion, not only to afford longer life but also on aesthetic grounds. This protection can be given either by an efficient painting scheme or by the use of a non-ferrous coating, such as aluminium or zinc spray, electro-deposition or hot-dipping. In any case, the surface preparation of the steel is important.

Different procedures are necessary for new and for old steelwork. Many steel plates and sections are hot-rolled to size and thereby acquire a layer of iron oxide or 'millscale' which is usually not perfectly continuous, and rusting will occur in due course. The best preparation for new work is to gritblast it. This process takes the form of impinging particles of an abrasive grit at a high speed on to the surface to be cleaned. It leaves the surface slightly roughened and suitable for receiving either paint or a sprayed coating of aluminium or zinc.

Another method is to 'pickle' the steel in hot or cold baths of sulphuric, hydrochloric or phosphoric acid until the surface is free from millscale and rust, and yet another, although a far less satisfactory one, is to expose the steel to the weather to loosen the millscale and finally to remove the scale as completely as possible by either mechanical or manual wire-brushing. In practice, paint will last four or five times longer on surfaces which have been grit-blasted or pickled than on those that have been hand-cleaned by scraping and wire-brushing, and the relative total costs of surface preparation and painting, including the initial costs and maintenance painting at appropriate intervals over 50 years are: grit-blasting, 1.0; pickling, 1.25; weathering and wire-brushing, 2.5.

Surface preparation

The surface preparation of an existing structure or implement depends on the condition of the old coating. Where this is sound and adherent it should be sufficient to give a thorough washing down with warm water containing 1% or 2% of a detergent to remove any oil, grease and firmly adherent grime. The washing is particularly important where airborne sea-salts are likely to have been deposited on the surface. Where old paint has flaked off, or where there are blisters, the surface should be chipped, scraped and wire-brushed, using mechanical tools if possible, or even grit-blasted. Areas of old adherent paint need not be removed if a perfectly smooth surface is not essential, but it is advisable to chamfer the boundaries to assist the flow of new paint over the uneven surface.

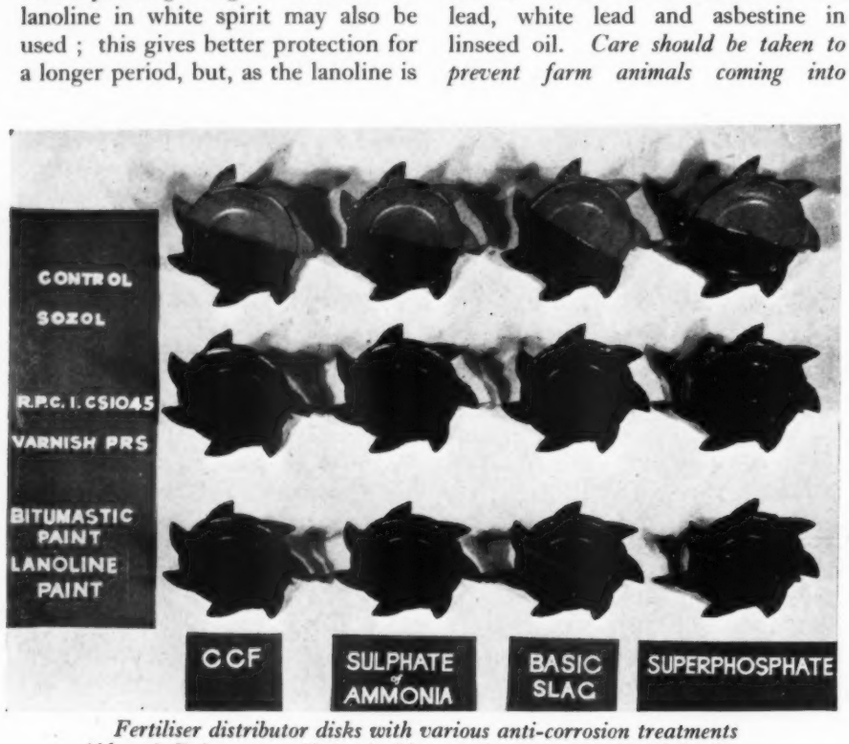
After thorough preparation it is necessary immediately to protect the surface from rusting. A metal spraying process will, in the majority of cases, be undertaken by an experienced and

professional sprayer who will ensure that the interval between grit-blasting and spraying is such that no visible deterioration of the surface has occurred. If the steel has to be left for any appreciable time in the bare condition, it is always advisable to coat it with a temporary protective, e.g. a thin coat of linseed oil rubbed on well with a rag. This will protect it for periods of up to three months in moderately corrosive conditions, and the oil is easily removed, if necessary, before painting is begun. A solution of lanoline in white spirit may also be used ; this gives better protection for a longer period, but, as the lanoline is not compatible with ordinary oil paints, it must be removed by solvents before further treatment.

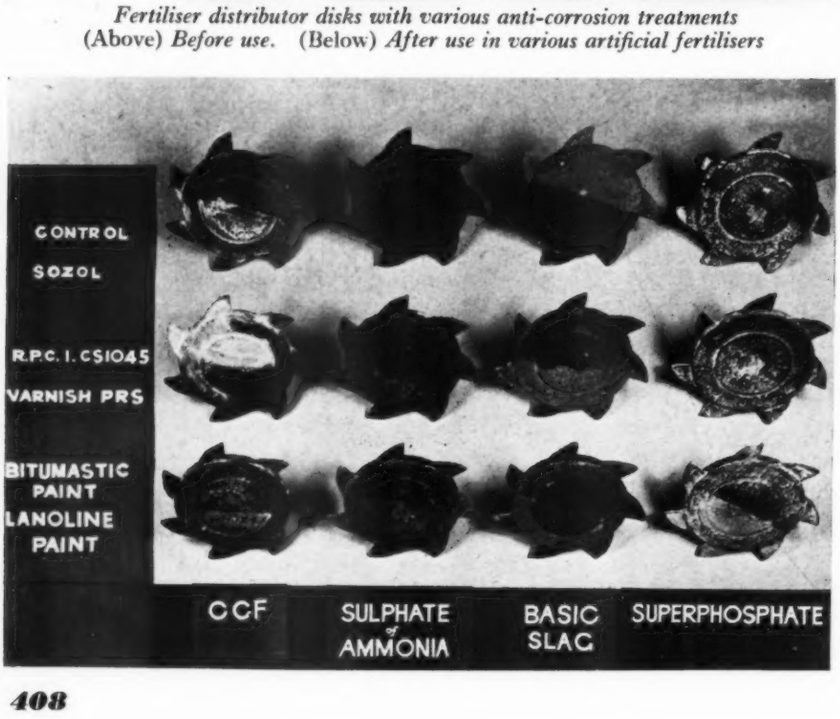
It is essential to use the right type of priming paint when a painting scheme is used. It should contain a pigment which will help chemically to inhibit rusting. The best-known of these is red lead, which has been used for many years for this purpose. Recent researches have shown, however, that an equally good priming paint, with better working and storage properties, can be made from a mixture of red lead, white lead and asbestine in linseed oil. *Care should be taken to prevent farm animals coming into contact with the wet paint, and to prevent contamination of drinking water, streams and ponds.* Other good priming paints, which contain no lead, are mixtures of zinc oxide, asbestine and either zinc chromate or zinc tetrahydroxychromate in linseed oil. The type of finishing paint is not critical when a good inhibitive priming paint is used, but probably one of the best is red oxide in linseed oil.

An efficient painting system, which should last from seven to ten years in rural atmospheres before repainting becomes necessary, should consist of two coats of priming paint, one of undercoat and one of finishing paint. These will produce a thickness of brush-applied paint of at least 0.005 in., which is essential for adequate protection outdoors. Coatings of hot tar—admixed with small percentages of slaked lime and tallow—may be used for some purposes, but they protect only for a relatively short period. Their low cost, however, makes it practicable to renew them at intervals of not more than two years, and if a thickness of at least 0.010 in. is built up, they are then both efficient and economical.

Maintenance painting should be done as soon as the paint film shows serious signs of failure by cracking or by blistering. In no instance should it be delayed after 0.2 to 0.5% of the surface has rusted, for the cost of reparation becomes increasingly heavier as more rusting occurs. The rate of breakdown usually varies on vertical, horizontal and inclined surfaces, and with the extent of exposure to sunlight. Patch painting can be used to advantage if only small areas have deteriorated.



Fertiliser distributor disks with various anti-corrosion treatments
(Above) *Before use.* (Below) *After use in various artificial fertilisers*



Ideal conditions

To get the best results all preparation and painting should be done under favourable conditions, *i.e.* when the temperature is over 60°F and when under the relative humidity of 80%. It is not difficult to ensure these conditions under cover and, if possible, farm tractors, ploughs, harvesters and other movable equipment should be transferred to suitable buildings. When existing outdoor structures are treated every effort should be made to put on at least the initial paint coat under the most favourable conditions. The best period for painting in Great Britain is April to September inclu-

sive, when the humidity is at its lowest. December and January should be avoided if at all possible.

Galvanised sheeting is used to a great extent in farming. The life of any zinc coating depends on its thickness and on the atmosphere to which it is exposed. A zinc-dust/zinc-oxide paint may be used, if necessary, to protect new galvanising. It is normally recommended, however, that galvanised steel should be painted after a lapse of time, which depends on the pollution of the atmosphere, during which weathering will take place and the surface will be slightly roughened to provide a 'key' for the paint. The surface should be cleaned down with warm water containing some detergent, and wire-brushed if necessary, and then a zinc-chromate type paint applied. In certain areas rusting may have occurred if unprotected galvanising has been exposed for some time. In this event it will be necessary to give a good wire-brushing, perhaps with mechanical tools, to obtain a clean surface, and then to use a good inhibitive paint. In some rural environments, however, painting may not be necessary; experiments on a plant at Llanwrtyd Wells have shown that after 25 years' exposure there is no serious breakdown of specimens carrying hot-galvanised coatings of 2 oz. zinc per sq. ft. of surface.

Wire netting and chain-link fencing are usually galvanised, but further protection is necessary. One of the best methods for new material is to weather it for a short time and then to dip the complete roll into a heated bath of ordinary gas-tar, draining it and storing it until dry. Existing fences should be painted with gas-tar two years after erection and every four years afterwards. The best method is to have the painting done simultaneously on both sides of the fence by means of large-size sweeping brushes and followed by complete 'brushing-in'. All vegetation and soil must be removed from the base of the fence before treatment.

Aluminium-coated steel may be of value for certain applications in farming. The flues of grass driers, for instance, are subjected to acidic gases containing high proportions of sulphur oxides. The temperatures may be anything up to 150°F and the humidity more than 95%. The picture at the top of this page shows a drier in which aluminium-coated plates (A and E) have been inserted: no deterioration was noted after nearly a year's exposure. The attack of the gases on the mild steel may be judged from the condition of the panel above specimen E.

A grass drier in Wales. The plates marked A and E are aluminium-coated and show no deterioration after a year's exposure to flue gases. Above E is a plate of mild steel

Sprays, dust and fertilisers

Sprays and dusts used in crop treatment may be the cause of severe corrosion. It has been found that mild steel, slow-rusting steels, brass and aluminium are heavily attacked, but that certain stainless steels and high-nickel alloys resist attack well. Agricultural chemicals are, however, rendered harmless when the containers (hoppers or spray tanks) are thoroughly washed after use.

Corrosion is wasteful and costly and must be prevented if the greatest and most economical use is to be made of steel, the cheapest and most adaptable metal known. Every effort should, therefore, be made to give the highest degree of protection by using the best materials and giving maintenance before any serious breakdown has occurred.

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Photos on pages 407 and 409 by courtesy of *The Field*; pages 406 and 408, National Institute of Agricultural Engineering.

Technical News

Articles in the October issue of other journals of the Leonard Hill Technical Group include the following:

Dairy Engineering.—'Preview of the Dairy Show, Olympia, 22–25 October', 'Mechanical Equipment for Cheese-making' by M. S. Dumbleton, 'Dairy Industry in South-East Asia, Part 2', by T. P. J. Twomey, 'New Bottle-filling and Refrigeration Plant'.

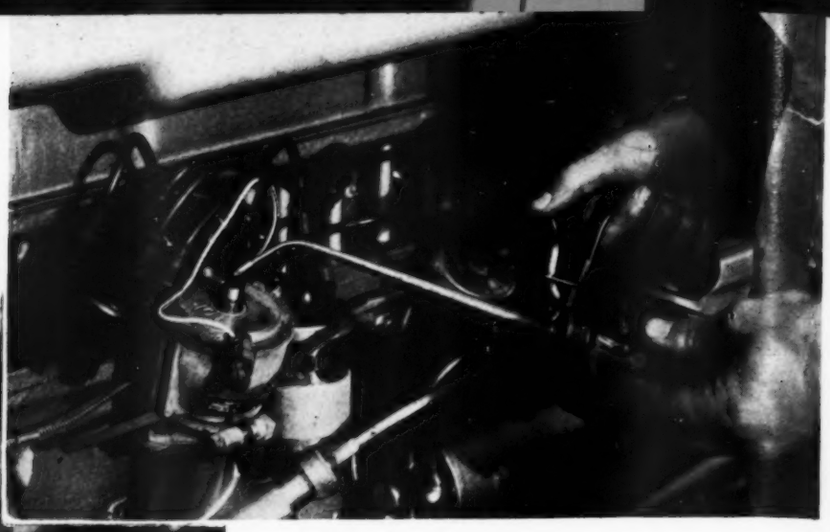
Chemical & Process Engineering.—'Aluminium as a Constructional Material for Handling Water' by E. W. Jackson, A.M.C.T., A.M.I.CHEM.E., 'Preview of the Corrosion Exhibition', 'Adhesion and Adhesives', 'Chemical Industry in Australia'.

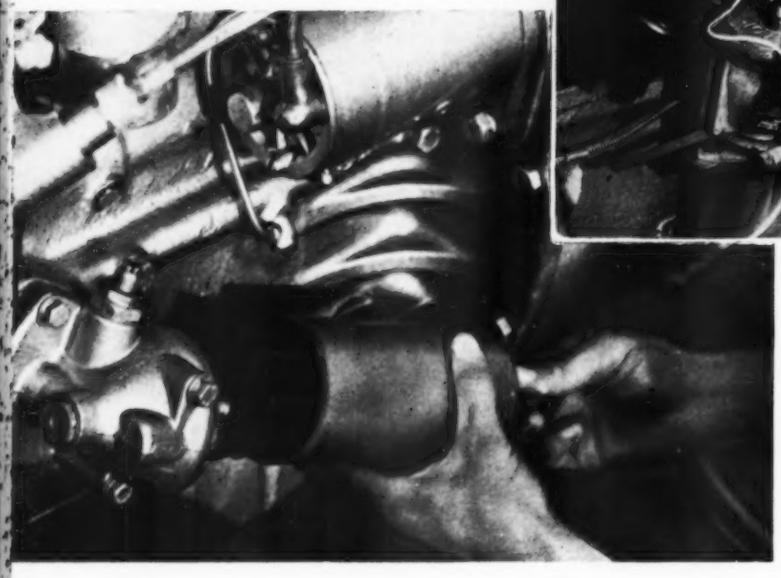
Manufacturing Chemist (which is a special anti-corrosion issue).—'Review of Corrosion Convention', 'Review of Corrosion Exhibition'.

Food Manufacture.—'Radiation Processing of Food', 'Primitive Man's Preserved Meat', 'The Use of Vacuum in Spaghetti Manufacture', 'Wiltshire Ways with Cheddar Cheese', 'Canning Peas in Western U.S.A.', 'Panorama of American Food Science', 'Thinking Ahead on Fuel Efficiency'.

Corrosion Technology.—'Metallic Surfaces Research', 'Corrosion Research (British Iron and Steel Research Association) Part 2—Methods of Protection', abstracts of Corrosion Convention papers.

Preventive Maintenance





Photos: Massey-Harris-Furguson

Notes on the proper care of farm equipment

(Above) *Details such as regular attention to the distributor materially improve the reliability of a tractor engine*

(Left) *It is essential to change the oil filter cartridge regularly if engine wear is to be avoided*

THERE is one golden rule for running farm machinery—service it properly and then work it hard. Tractors and implements are designed for such conditions, and if properly cared for they will give years of trouble-free, profitable service.

The daily check

Throughout the harvest period particularly, when men and machines are working to the limits of their capacity, the proper servicing of farm equipment is absolutely vital. The first item of preventive maintenance is the daily check—and the best time for this is at the conclusion of the day's operations. Unfortunately, this is the very reason why it is so often skipped, because the operator is tired or because no time has been allowed him for this very necessary duty.

A tractor should always be left clean and ready for work, because at the end of the day it is not known how long it may be laid up, owing to adverse weather conditions or other reasons. It is when a machine is lying idle and unused that the greatest harm can be done through neglect.

Combines, for example, must be greased thoroughly at least once a day, and blocked nipples should be cleared without fail. Once a bearing runs dry on any machine it will break or seize up and stop the entire operation.

Air cleaners, particularly, tend to be neglected, yet they are all-important if an engine is to run properly. An air-cleaner blocked with dust cuts off a vital supply to the engine. It then runs with too rich a mixture, becomes overheated and uses excessive quantities of fuel.

Similarly, radiators should be cleared out at regular intervals, or if the engine is air-cooled, the vanes around the cylinders must be kept free from dust and chaff. Indeed cleanliness, both inner and outer, in any machine is a great virtue. It makes for efficient running, eases maintenance work and reduces fire risks.

In the case of diesel engines, the greatest possible care must be taken to ensure that the fuel supply is really clean. Sludge from storage tanks must never enter the fuel tank of the machine or tractor, or severe engine damage can result. The filler cap of the fuel tank must be cleaned round, before removal, to ensure that dirt does not fall in when it is removed, and the cap needs to be examined to see that the breather hole is clear, otherwise a vacuum will be created inside the tank and the supply of fuel will cease.

Particular care needs to be taken when a machine has been operating under very dusty conditions, and if the engine oil changes colour, the oil filter cartridge may need to be changed earlier than is normally recommended. To use an oil filter for longer than its useful life is always a false economy because when the cartridge has reached saturation point the oil will by-pass and will then be used in an unfiltered condition.

Makers' instruction books give a well-prepared plan of how each machine should be serviced from day to day. It is well worth following the rules, for a few minutes spent each day on careful servicing can save hours of delay later on when the rush of work is at its height.

Laying-up

At the end of the harvest period in particular, the proper laying-up of combines and balers should receive serious consideration. Massey-Harris-Ferguson, for example, provide a comprehensive scheme whereby each machine can be given a thorough check-up by an expert. It can then be fully cleaned, repaired and serviced, so as to be ready for the next season's work. In addition it will be so well protected that there need be no fear of rust and dirt creeping in and reducing its efficiency. A little money spent in the winter will be repaid over and over again during the following summer. By making use of such a scheme, the next harvest may be tackled with confidence, without the over-hanging fear of a major breakdown.

MECHANISATION OF TREE FOOD CROPS

R. J. COURSHEE

(*National Institute of Agricultural Engineering, at present FAO Specialist attached to the Government of India*)

Most tree food crops are at present produced without any mechanical aids. From planting to harvesting, most of the necessary agricultural operations are being done by hand, and this seems likely to continue for some time. Recent progress in mechanisation in fruit orchards, however, points the way to possible developments for other tree food crops.

TREES differ from ground crops in that they are perennials with a permanent above-the-ground structure and they are also large plants. It is obvious that fruit tree mechanisation can never be as complete as the mechanisation of cereal and other arable crops, but people who grow coconuts, apples and oranges may well view with envy the efficiency and the economy of effort with which work is now carried out by those who grow sugar-beet, wheat and potatoes.

Apple trees can be propagated, planted and grown to make them suited to the use of more machinery and less labour. Dwarfing stocks on short trunks bring the head of the tree down and although this method of growing is valuable for other important reasons, it does, incidentally, make the trees easier to spray, to prune and to pick. The same applies to the pyramid and other ways of shaping a tree and to hedge-planting which spaces the trees about one metre apart in the rows, with three metres between rows. Such growing methods are not generally practised for most tree crops.

In some countries, fruit-growing is an advanced art because the labour costs of producing fruit are high or labour is scarce. There is, therefore, both a need and an incentive to use mechanical aids wherever possible. In other countries, in some of which commercial fruit growing is not so highly developed and where there is an abundance of cheap labour, there is little need, as yet, to mechanise food tree growing.

What I can describe of mechanisation in orchards is, at present, largely confined to apple orchards; but large areas of tropical tree crops will, because they are so much bigger, have much to gain from mechanisation.

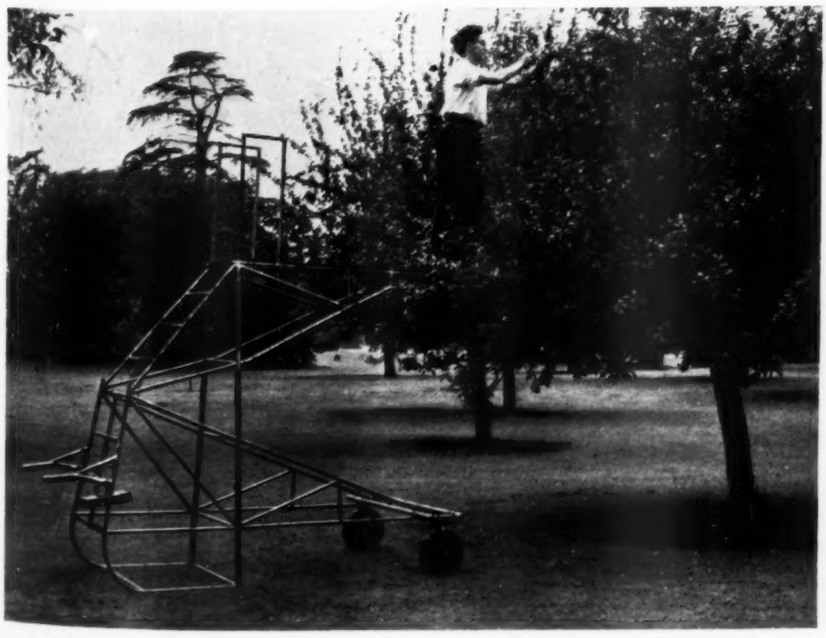


Fig. 1. Harvesting apples from the platform of a mechanical transporter

Reasons for mechanisation

The main motive for mechanisation is to allow a few people to do the work of many. Where, as is sometimes the case, the machine does not replace labour, there can be other reasons for the adoption of mechanical aids ; a machine could make work easier or more pleasant, without speeding it up. Detail pruning with power equipment is an example. Also it is possible for a machine to do a better job than is normally done by hand. This usually implies, however, that given enough willing skill, the work could be done as well or better by hand—it is just that the skill is not available. As an example, we might compare a rotary scythe with a hand scythe. Not only is the rotary scythe, which is driven by a motor, very much quicker but it also does a better job of cutting grass between apple trees than that which is likely to be achieved by hand scything.

Finally, a machine might do work which simply did not seem to be worth doing until a suitable machine was available. Thus the advantage to be gained from spraying coconuts may not be great enough to warrant the cost of spraying them by hand, but as soon as suitable machinery becomes available, the task then becomes worth while.

On this basis, the following are the main fields in which a larger degree of mechanisation is possible.

Firstly, the most obvious is harvesting and removal of the harvest. A recent study showed that even in the comfortable conditions of English

Fig. 2. A pruning operation being carried out from the adjustable platform of a motor-driven transporter

orchards, harvesting represented about 30% of the total orchard costs and about 60% of the labour employed in orchards over the year is needed for picking.

Secondly, there is the problem of the chemical methods for the control of pests and diseases.

Thirdly, bearing in mind the rather specialised needs of soils in tropical areas, there is the part yet to be played by the mechanisation of the operations of soil treatment and crop nutrition.

This list could be extended further in other directions of rather less importance, such as machinery for the removal of senile trees and for planting.

Harvesting fruit

Trees differ from annual crops in that the harvest is relatively inaccessible and the plant cannot be cut down to obtain the crop. One solution is to shape or so arrange the tree that the crop is easier to reach.

A report on the possibilities of mechanising apple harvesting once considered a machine to pick apples, but this is a wrong approach. It is, for instance, better to have a machine to *help* harvesting by transporting the picker to the crop in the case of apples. However, for nuts and similar robust fruit, mechanical pickers in the form of a tree shaker might be feasible.

Mechanical transporters for fruit pickers tend, on the whole to take two forms. If a tree forming part of a thin hedge is to be reached the transporter is usually no more than a simple elevated platform. These are occasionally motor-driven or tractor-drawn ; sometimes they tow behind them a trailer to be loaded with the picked fruit.

A simple unit is shown in Fig. 1. It is easily moved over all but newly-cultivated surfaces by one person. In aiming at such cheapness and simplicity, however, it was found that the bulk of the fruit picked quickly becomes an obstacle, and two people are needed, one working on the platform and the other on the ground to take the full boxes away.

Fig. 3. The high-speed rotating nozzle of a 'Micron' sprayer for low-volume spraying

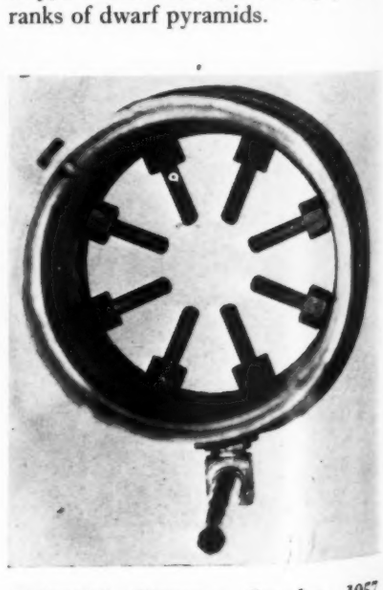
Fig. 4. A simple airblast nozzle for small-volume spraying at very low pressures

In contrast to this, if the trees are of the usual type with a roughly spherical crown, then most parts of the tree can not be reached from a simple platform transporter. For this type of tree or for tall trees, a more complex machine is required and Fig. 2 shows an example of this type of unit. It is motor-driven, the platform being moved hydraulically by oil-operated rams, attached to the two jibs, and the whole being mounted on a turntable.

Once the crop is in the box it is carried out of the orchard in various ways. For short hauls of about a mile, tractor-mounted pallets are a more economical method of moving fruit than placing the boxes on trailers. For longer hauls, bulk handling of fruit in trailers may replace conventional handling in boxes. Apples and peaches, for example, are easily damaged and it has been found in New Zealand that for apples, less damage is caused and a considerable saving results if the apples are placed in a large bin, holding several hundred bushels, carried on a trailer.

In the packing shed, the bin is slowly emptied, by mechanical means, on to belt conveyors leading to the graders. The system is yet to be seen in England but is becoming common practice in New Zealand and has been in use for a long while for oranges.

If mechanical aids to harvesting are to be fully exploited, hedge-planting will be desirable. The characteristic appearance of apple orchards with wide grassy expanses between tall well-spaced trees, may have to give way, more and more, to closely-packed ranks of dwarf pyramids.



Control of pests and diseases

Largely for the same reason—inaccessibility—spraying has come along slower to oil palms, coconuts and coffee than it has to ground crops. The conventional methods of apple-tree spraying of near run-off spraying, using upwards of 100 gal. of water diluent per acre, are hardly applicable on the large scale of operation demanded by tropical plantation crops. Under these conditions, 10 gal. per acre is considerable and 1 or 2 gal. per acre, applied as oil solutions or as suspensions of either insecticides or fungicides, is a more practical proposition.

Successful work along these lines has been reported from a range of crops and places. Spraying machines of the same basic form—nozzle and airblast to propel the spray—have been made in all sizes from the smallest portable, through to wheel-barrow-mounted models and up to the very large trailer-mounted machines.

It is reasonable to assume that drop size is important, both because it controls the distribution of the spray in part and because it determines the form of the spray deposit. Therefore we can expect that nozzles able to give fine or coarse spray with, at choice, a wide or a narrow spread of drop sizes about the mean, will be required when such small volumes as a few gal. per acre are applied.

High speed rotating nozzles, *e.g.* the ' Micron ' sprayer nozzle in Fig. 3 may be valuable. Because of the small volumes to be used and because large apertures are convenient, it is essential that nozzles should work at very low pressures. A simple and efficient airblast nozzle is shown in Fig. 4 which fulfils these requirements.

A fan to propel the spray may, or may not, be necessary. Opinions have been expressed that tree sprayers should act as placement sprayers, that is, they should place the spray where the jet of air aims it so that the deposition of the spray can be controlled from the ground.

A series of observations at the N.I.A.E. has shown however, that this is a false conception of the mode of action of tree sprayers and that almost all the useful deposition occurs as drift and therefore, under most weather conditions they are all drift sprayers. A large fan is not therefore necessary to propel the spray. If the spray is fine, turbulence will carry it to the crowns of the trees, but if it is coarse it must be blown up there on a stream of air or pumped up to the top of a mast and then allowed to drift down on to the crop.

Fig. 5. A motorised tower sprayer for high trees

With this basic conception, a ' small volume ' sprayer can assume a number of forms, *i.e.* the same type of machine can be portable, wheel-barrow mounted, or trailer-mounted, etc. Two contrasting examples of small volume sprayers for trees are shown in Fig. 5 and 6.

Soils

Soils in the tropics are more likely to be spoilt by loss of organic matter or by erosion than are those of temperate zones, and it may be necessary to bring organic mulches into the orchard or grow green manures to conserve the soil. Each operation sets mechanical problems.

A vegetation cover alone is not sufficient to prevent run-off and it is necessary to open up the soil while disturbing as little as possible the feeding roots near the surface. Whereas this is normally done by loosening clods of a soil with a forked mansti, a hand tool similar to that known in England as a Canterbury hoe or forked mattock, it is also possible to produce the same effect mechanically with a ' culticutter '—a roller mulcher with radial blades, extending the length of a heavy roller.

The culticutter, and various forms of trash, straw or sod choppers can be used to incorporate organic matter or standing green manures into the soil without fear of exposing the soil too much to the forces of erosion.

The spherical wheel tractor also promises to become the tropical tractor for use in the larger plantations. It can traverse any form of water-logged soil and is stable on 1 : 1 slopes. Although rotary cultivation may displace any form of ploughing, a tractor will still be necessary for the haulage of the cultivator or other implement.

To obtain the maximum benefit from the mechanisation of tree crops, it will be necessary to combine small individual properties or to develop the cultivation of such crops on a plantation scale.

Fig. 6. A tractor-drawn sprayer for low tree crops

The Market for Agricultural Equipment in Africa

IN parts of the Continent, development schemes are planned which will bring the surrounding areas to the threshold of an industrial revolution.

Agriculture cannot remain unaffected by this movement. In years to come, African farmers will be faced with even greater competition from the growing industries that will arise in the wake of such schemes as the Kariba and the Volta river projects. Many parts of the Continent are turning more and more to mechanisation in agriculture—as witness the increasing usage of tractors in Africa since the war. But, even today, there are untapped needs.

It has been estimated that Africa has 1½% of the world's tractors spread over 9% of the world's farming land. In contrast, the North American continent has some 80% of the world's tractors and between 8 and 10% of the world's farming land.

Africa today has unparalleled opportunities for development and her raw materials are one of the keys to world prosperity in this atomic age, when new sources of food are as necessary as new sources of power.

African governments and tractor manufacturers are turning their attention more and more towards the problems involved in meeting these demands.

One of the most promising steps in this direction is the growing realisation that both sides must co-operate to ensure the fittest tools for the job of mechanising African agriculture. The East African governments—Kenya, Tanganyika and Uganda—for example, are now co-operating with the British Colonial Office and agricultural experts in plans to set up a tractor- and machinery-testing station in Kenya. Exhaustive field tests will be made at the station to ensure that machines for the African market meet the requirements of local conditions. It will be a two-way flow of experience and ideas. African farmers will be encouraged to bring their problems to agricultural experts, schooled in African problems, who will maintain top-level liaison on new developments in agricultural machinery in Britain.

Many observers believe that the market for tractors and agricultural machinery in Africa over the next 20 or 30 years is very great indeed and a leading African agricultural expert has described this project as a major step in the right direction for British and African collaboration.

In many parts of the Continent, and notably in the Federation of Rhodesia and Nyasaland there is an awakening interest in soil conservation.

In the Union, the farmer is being encouraged by government subsidies and other methods to purchase equipment, suitable to the size of his holding, in order to carry out protective measures on his own account. This is additional to the Soil Conservation Act and the Government Soil Conservation Service.

Southern Rhodesia has been divided up into a large number of districts or divisions, each with its own divisional administration with a central co-ordinating body and a research station.

In the new state of Ghana, the Gonja Development Corporation is at work in the Northern Territories developing pilot schemes to satisfy themselves that the terrain and local conditions are suitable to sorghum, tobacco, groundnuts and similar crops. One feature of these schemes is the interest in the possibilities of mechanisation.

In Nigeria, the Federation's growing consciousness of the need to mechanise agriculture has been emphasised by the Federal Minister of Trade and Industry, Mr. R. A. Njoku.

One of the compliments paid to

South Africa—Gem III inter-row weeding a young crop of maize

East Africa — A Ransome 'Proconsul' TS.3J 5-furrow share plough exerting a drawbar pull of 6,800 lb.

British tractors, particularly the medium and small tractors, is their adaptability. In Africa, where time is often on the side of the developers, it has been found possible to use the lighter tractors to do the work of more costly heavy equipment.

A Colonial Development Corporation spokesman instanced their own experience in Nyasaland. It was found on one of their projects tha there was not enough water available to plant tobacco early enough for it to become a good crop.

There were no rivers nearby, but a trickle of water was found in a gully in the rainy season. The manager of the project decided to dam the gully and began work with a well-known British light tractor and ordinary farm trailer. The experts scoffed and said he could never do it with such light equipment. Last November, however, the dam was completed.

In Swaziland, ranching country was transformed into arable lands by tractors, which harnessed the scant rainfall in dams and irrigation systems, levelling out fields for rice cultivation in terraces, on the hillsides. Today small tractors are in daily use and cultivation will increase considerably when tractors are used to drive a new canal through the area.

Changed cultivation methods

An example of ways in which the advent of British farm equipment and tractors have changed cultivation methods is to be found in Rhodesia. Maize farmers there have had to double the distance between rows, from 3 ft. to 6 ft. in order to utilise tractors and equipment for weeding and mechanical cultivation. As they were able to plant the maize more closely in the rows, yields per acre remained the same after mechanisation.

The conception of wide crop-spacing to admit narrow tractors fitted with special tools, is gaining in popularity and these tractors are now finding their way into other crops, such as the Kenya coffee plantations.

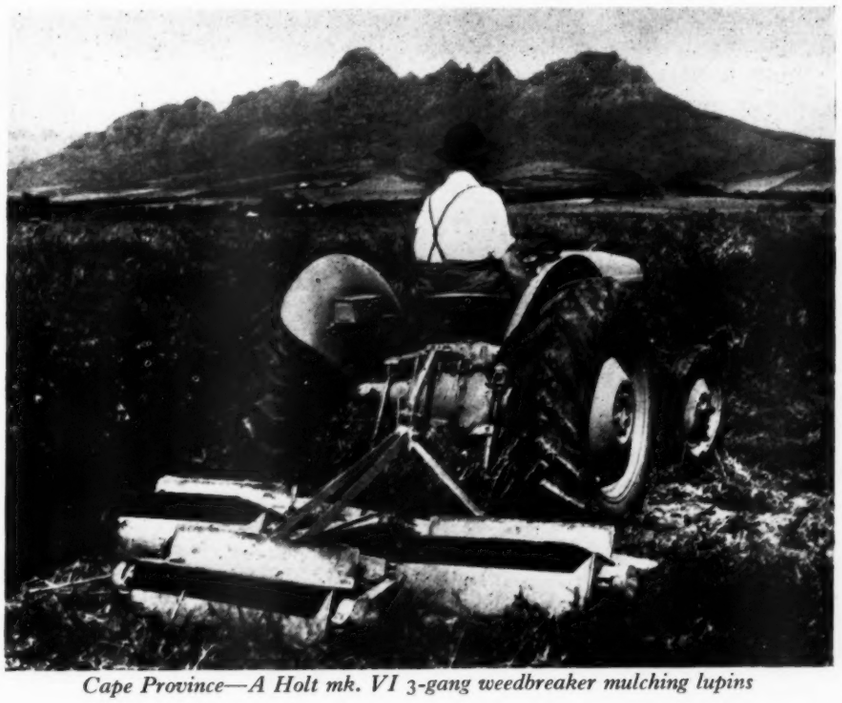
The following are on-the-spot reviews from correspondents in the field, on market possibilities in the main regions of Africa.

The Union of South Africa

Johannesburg:—Leading distributors see a bright future for agricultural tractor sales in South Africa. The lower h.p. tractor is by far the most popular in South Africa, especially for the smaller farms, but a new 35-h.p. tractor is in prominent demand for bigger holdings.

Pricing does not appear to be a vital sales factor here as the cheapest available, European model, is so far sold in only negligible quantities according to its agents. The special appeal of British machines rests on their sturdiness in construction, economy in operation and other advantages such as dustproofing and automatic starting.

In consequence, British machines are today leading the field, having further



Cape Province—A Holt mk. VI 3-gang weedbreaker mulching lupins

increased their lead over the next nearest competitor since 1955.

In the field of agricultural implements, however, praise for U.K. products was rather lukewarm. Common complaints are insufficient attention to local conditions, long delivery delays and lack of flexibility. It is pointed out that Czech and German implements can be used on any make of tractor and *the Continental firms have resident experts studying market needs and attending to maintenance problems, etc.*

However, imports from the U.K. are at a moderate level and could probably be increased, if attention was paid to these points, especially for disk ploughs, mould board ploughs, harrows, cultivators, one-way disks, planters, mowers, and grain drills.

In the field of heavy tractors American makes still dominate the field although increasing mention is made of some British makes. Sales of the British heavy models are improving to provincial administrations and municipalities and they were narrowly beaten in price in the last railway tender by the Americans.

The extensive railway expansion programme over the coming years appears to be the biggest potential outlet for heavy U.K. equipment.

Ghana

Accra:—The use of agricultural machinery such as tractors is still in an early stage in Ghana, mainly because of the small size of peasant cocoa plantations in the agricultural regions. Yet there is promise of expansion and the possibility of introducing them by co-operative methods is the likeliest avenue in this field.

In heavy work, caterpillars are preferred, and caterpillar tractor dealers say that hundreds are in use in the timber regions.

One of the problems is said to be the difficulty of servicing, since Africans are not undertaking this. One government expert has suggested that a mobile servicing scheme by enterprising dealers would assist the trade considerably.

The possibility of operating on the coast plains is said to be strong, if servicing needs can be met. There has been a certain amount of experimental work in irrigation in the Accra plain.

The possibility of tractors being used more intensively on public contract work in the future is not so bright as it was a few years ago. In the past five years, Ghana has spent £120 millions on road development. She now has a road system comparable with anything in Africa, but new priorities are likely to arise in the future.

In the long-term, the Volta hydro-electric scheme could make a difference, particularly in the northern territories by means of irrigation and improved communications. This is a very long term project, however, for it would take ten years to complete, even if started tomorrow. Tractors, however, have already proved their worth in the northern territories.

In the field of agricultural equipment, the Agricultural Department is already trying to stimulate the use of sprays and similar implements. Experts believe that the best possibilities lie in small beginnings. Farmers may be interested in the sort of implements market gardeners would use, but which will stand up to tropical conditions. For this reason, they say, *servicing arrangements are imperative* and would be useless, if stationed only in Accra.

Nigeria

Lagos:—Mechanisation of agriculture has made most progress in the Northern Region of Nigeria. About 24 maize planters are operating at the present time, while heavy tractors are being used for deep-ploughing in the rice fields of Maiduguri and on a wide-scale rice scheme in Birnin-Kebba. These tractors are also in use on irrigation projects at Bida, north of the river Niger.

In Oyo, in the Western Region, the Regional Agricultural Department is carrying out trials on all tractors in a search for the one which will be most adaptable to Nigerian conditions. In other parts of Nigeria mechanisation has been slow because of the absence of large-scale agriculture.

Agricultural equipment in use includes disk harrows, disk ploughs, riggers, cultivators and mould board ploughs. The majority of these are bought only by the agricultural departments and production boards.

For some time now, however, local engineers have been seeking a mechanised means for making ridges for yam cultivation. No satisfactory answer to this problem has been discovered yet.

Tractors that are likely to be of most interest to Nigeria in the future are those which can be used for industrial work, as well as on the farms. There are far more tractors being used for industrial work at present than in agriculture. Demand is more for medium- than for heavy-weight tractors. Difficulties of transporting heavy equipment to sites remote from the railways are considerable and in many areas, the use of even medium-weight tractors is not yet possible due to the inadequacy of bridges en route. Britain remains the principal supplier as it is the new government's policy to purchase, where possible, from soft currency areas.

East Africa

Nairobi:—British manufacturers of tractors, agricultural machinery, and hand and agricultural tools and implements have been meeting growing competition from competitors in British East Africa—Kenya, Uganda, Tanganyika and Zanzibar.

The economy of the region as a whole is still based on agriculture and is likely to remain so in the foreseeable future. Its prosperity, or otherwise is dependent largely on the state of world commodity prices and the economy's sensitivity is linked particularly to the course of prices for such crops as coffee, tea, cotton and cereals.

Export prices have tended to fall somewhat in recent years with the result that farmers are no longer buying, regardless of expense, as they did in earlier post-war years. *The price factor has become increasingly important.*

The Congo Basin Treaties embrace the whole of Kenya, Uganda and Tanganyika with the result that no preferential customs tariffs exist. There has been, for example, considerable purchasing from America of tractors and agricultural equipment which, it has been claimed, could not be obtained on competitive terms elsewhere. In this way, the British East African market became a strict testing ground for British industry's competitiveness generally.

It has been computed that the tractor population on private farms in the European highlands of Kenya is in the region of 3,800 wheeled tractors and 1,080 crawler tractors.

THE AGRICULTURAL ENGINEERS ASSOCIATION

In its task of providing equipment for use in widely varying conditions all over the world, the British agricultural engineering industry can rely on the resources of one of Britain's most efficient trade associations —the Agricultural Engineers Association.

THERE are many reasons for optimism concerning export prospects of British farm machinery but an important one is that an Agricultural Revolution is beginning in the world which closely resembles the pattern of the Industrial Revolution in England in the early 19th century. Thus there is:

(*a*) A reduction in the death rate leading to the substantial increase in population.

(*b*) An ever-increasing demand for food and rising standards of living.

(*c*) An increase in the birth rate which is likely to continue during the next 10 to 20 years.

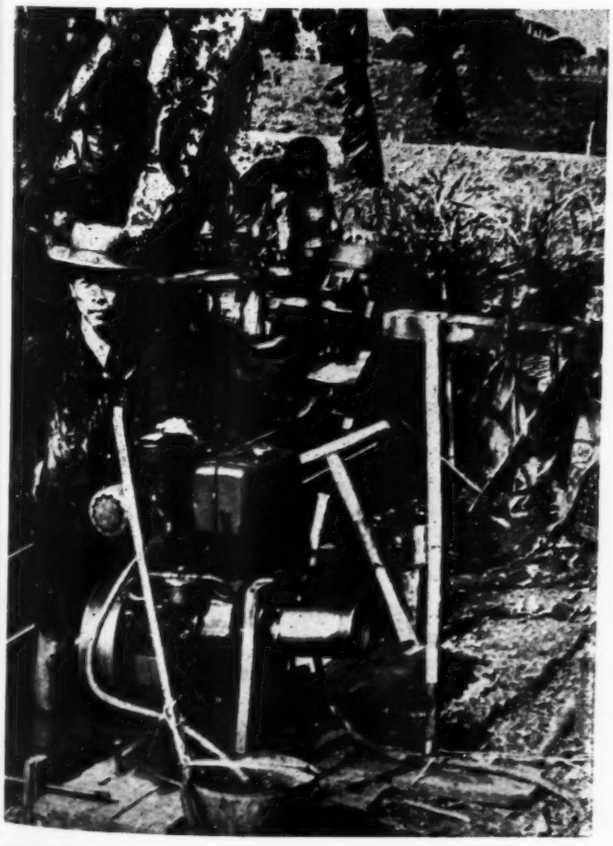
A revolution

These powerful forces represent a political challenge, entirely unparallelled, and the only comparison one can make is the French Revolution. How can political and economic trends of the day be resolved ? The Association holds no doubts that their industry has the answer to this very grave problem. Hence the optimism.

In addition to Asia, there are other markets which badly need agricultural machinery—South Africa, Rhodesia, British African Colonies, South America and the *Iron Curtain Countries.*

The Association believes the British industry is competent to meet the challenge because it possesses wisdom based on long experience in dealing with backward countries, technical skill to train the native population and engineering products to suit most requirements—large, medium or small. The problem is, admittedly, enormous but one which the Association with its members is tackling and one which presents a real challenge to the efficiency of mechanisation.

The U.K. agricultural engineering industry, made up of a number of companies of varying size and varying degrees of specialisation, is highly competitive. It is not dominated by large combines, or restricted in any way by its own trade association, the A.E.A. But in a world where international trade is, of necessity, subject to some degree of control, any exporting industry must have some organisation through which it can negotiate with overseas purchasing missions and provide information on its goods, both nationally and internationally.



Siam — A Petter AV1/5 diesel engine driving a water-wheel on a farm near Bangkok

Inquiries and information services

The Association, although it represents some 90% of the industry in Britain, makes no attempt to be exclusive. If it receives an enquiry from overseas for a certain type of equipment made by a firm outside the Association, it has no hesitation in passing on the name of that firm to the enquirer. It would like all agricultural machinery manufacturers to become members, but it exercises no pressure on them to do so. And for the overseas importer who approaches the Association for guidance, these are factors of some importance.

The Association also helps the home exporter. For of the first essentials for any exporting company is not only the information on possible markets overseas, but also information on such matters as actual or possible variations in the cost of raw materials. It is one of the most important functions of the Association to provide information of this sort to its members so that by reducing manufacturing costs they

Libya—A Ransomes ' Polydisc ' TD 15 exerting a drawbar pull of 5,000 lb. With a combined seeder and fertiliser attachment, the ' Polydisc ' will cultivate, fertilise and sow seed in a single operation

may continue to sell goods abroad at an economic price.

Information of this type is provided to agricultural machinery manufacturers through the Association's cost investigation committee. This committee, which is composed largely of accountants from member firms, examines the cost of raw materials, freight, labour and indeed everything that contributes to the final price of a piece of agricultural equipment, down to such things as light, heat, rates and rent charged to individual firms.

Price trends

The Committee meets every three months, and adopting an index figure of 100 for the first day of the year, forecasts price variations related to this figure for the following six months.

Last year, the committee's forecasts on price trends were within 0.1% of the correct figures. These forecasts are of particular value to smaller companies unable to carry out detailed costing themselves since they make possible cost analysis on which reductions in selling prices may be based. It enables the small and medium-sized manufacturer (and even the larger producer) to assess whether his costs are rising or falling—in relation to other producers, *i.e.* it gives him a ' standard ' of efficiency.

Of equal value to the individual manufacturer are the trend reviews, based on figures provided by over 60% of the members. These are published privately by the Association each month. They are broken down into individual countries and types of machinery, and record trends in production, home sales, and export sales. They thus provide a yardstick whereby members can measure their own production, and sales in various markets.

Market reports

Reports on markets in individual countries are also prepared by the Association, and are known as ' Prospects-for-Trade ' reports. These examine present and potential values for the next four years of various overseas markets. The first, which dealt with Sweden was issued in November, and others appeared, or are appearing in January, and each subsequent month. These reports not only study the state of the market as far as exports from Britain are concerned, but also the activities of foreign competitors in the same market.

Year-book

A recent venture on the part of the Association is the preparation of a Year-book for the industry, which will be published at the end of the year. It will contain amidst a variety of useful data, a list of Association members, their telephone numbers, postal and cable addresses, with the products they manufacture and their home and overseas agents. The directory which is cross-referenced, will thus be a valuable world guide of the British agricultural engineering industry.

Publicity

A Public Relations Committee, which includes among its members the public relations officers of member firms, provides a forum for all members to meet and discuss the various ways of publicising British farm machinery at home and overseas; and it will be through the Agricultural Engineers Association that the industry will be represented at forthcoming trade fairs in Helsinki and Brussels.

The Association is also responsible as part organiser for the annual Smithfield Show, where in co-operation with the Smithfield Club and Society of Motor Manufacturers and Traders, their members exhibit their products. The Smithfield Show is considered to be the largest and most comprehensive show of its kind in the world.

Negotiation, consultation and liaison

The Association speaks for the industry as a whole in negotiations with the U.K. and overseas governments; and is constantly being called on to brief trade missions proceeding overseas on the equipment and service which the industry can offer. In acting as a liaison organisation between persons and organisations overseas and individual companies, it has made possible the training in Britain of men and women interested in the mechanisation of agriculture. It co-ordinates research work carried out in many overseas countries to discover the type of machinery most suitable for local conditions; and, since it is able to draw on the combined experience of manufacturers who have themselves tested agricultural machinery in all conditions where husbandry is possible, is in an unrivalled position to offer expert advice on the problems of mechanised agriculture in any country in the world.

Water for Sudan

A gigantic project which will convert barren land into good farming land for the cultivation of cotton and pastures

Water from the Blue Nile. The new canal will carry water to 300,000 acres of arid land, when completed

MORE yards of earth are being moved each day by crawler tractor-drawn scrapers on the Managil Canal in northern Sudan, Africa, than on any other project in the world, according to engineers who have visited the project—the construction of a 96-mile canal from Sennar to Managil.

Berger-Holzman, a company from Wiesbaden, Germany, has been awarded a contract by the Gezira Board of Sudan to develop and operate 300,000 acres of now barren land. Cotton and berseem (a clover) will be grown and irrigated by waters from the Blue Nile.

The first 2½ ft. is a very dry, loose black soil, good for growing cotton. Next is about 1½ ft. of hard pan which must be ripped. Below the hard pan is a dry, hard, yellow clay. Although the clay is difficult to load in its natural state, if it is ripped the material becomes so powdery it merely rolls before the partially loaded scraper, like dry sand.

The finished canal will be 200 ft. wide and 13 ft. deep, at Sennar, decreasing to 150 ft. wide and 6.5 ft. deep, at the Managil outlet, with side slopes of 2:1. Excavated materials will form dykes on each side, 5 ft. back from the lip. Each dyke will be 12 ft. high and 32 ft. wide at the top.

Because of the hard, dry soil and the short hauls (longest haul only 600 ft.), Berger-Holzman decided to excavate for the canal with crawler tractor-scraper combinations and purchased for this project: 36 Caterpillar D9 tractors, 30 No. 491 lowbowl scrapers, six No. 9 rippers, eight D6s, four No. 12 motor graders, two DW20 tractors with No. 456 lowbowl scrapers and two 'Martin' trailers.

Berger-Holzman set up the equipment in groups comprised of four D9s with No. 491 Scrapers, a D9 pusher, a D6 to finish slopes, and a No. 12 Motor Grader to level roads, finish slopes and maintain the fill. The groups start about a mile apart along the canal.

Few trained operators were available so the Caterpillar Tractor Co. organised training classes for mechanics and instructed operators to man the first four groups.

For three months of the year, from July to September, northern Sudan is very wet. For the remainder of the year it is very hot and dry. Day-time temperatures reach 120°, with the nights a relatively cool 95 to 100°F.

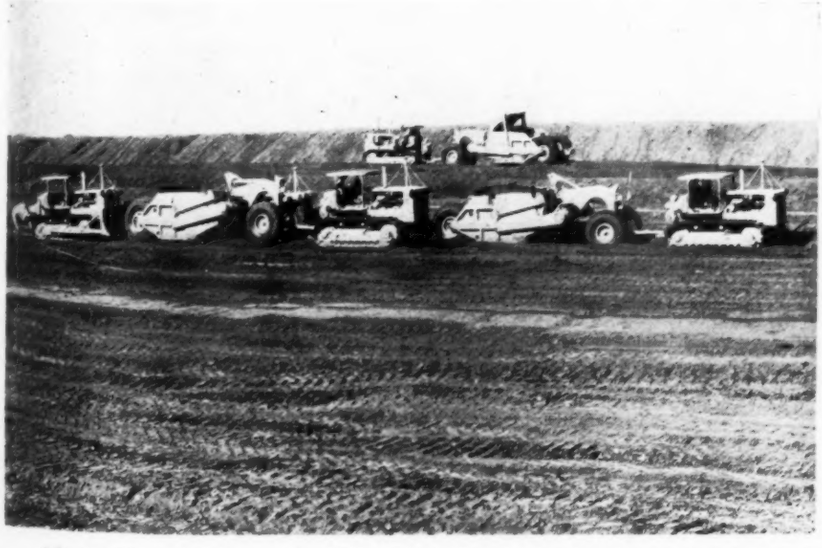
During the first month of operation working two 10-hour shifts a day, each group moved from 275 to 300 loads per shift. As the operators become better trained, the contractor expects to average about 400 loads each 10-hour shift.

Pushloaded by a D9, the D9-No. 491s pick up about 28 loose yards in 1.17 minutes down the 100-ft. ramp. A complete cycle takes about 4.25 minutes. The units load down the 12% slope, turn to climb back up the slope to ground level, dump on the 12% face of the dyke and return to the cut. Hauls average about 500 ft.

Starting in May 1957, Berger-Holzman expects to complete the canal in two years. Under contracts yet to be let, the Roseri Barrage will be constructed across the Blue Nile near Sennar to dam up waters for this canal.

About 300,000 acres, now unused, will then be opened to settlers by the Gezira Board. The Board will supply a home and 20 acres of land to each settler, the heavy equipment to till the soil, and cotton and berseem seed. The settlers will plant the seed, cultivate the crops and harvest the plants. The board will gin and sell the cotton.

The Gezira will pay each settler an annual base rate for working the land, plus a percentage of the profits from the sale of crops produced on that land. About 40% of the final sale price will be retained by the Gezira Board to carry on redevelopment work and to repay Britain the original loan for this project.



Caterpillar tractors at work on the new Managil Canal project in Sudan

Sugar in Uganda

E. A. JONES

ONLY 35 years ago, the idea of a sugar industry in Uganda Protectorate, in the heart of ' Darkest Africa ', 800 miles from the nearest coast, seemed absurd. Much of the country was then under jungle and lions, leopards, buffaloes and elephants wandered freely along the dirt tracks which served as roads. The long haul to the coast made sugar export uneconomic and it was said that African people ' didn't eat sugar, anyway '.

Today Uganda produces about 55,000 tons of sugar a year, more than enough for her needs, and the 33,000 acres of sugar estates, employing about 20,000 people, are the most highly mechanised agricultural project in East Africa. Sugar consumption by Africans is rapidly increasing and it seems possible they may consume much more than the European.

Increase in acreage

The time is ripe for a big increase in sugar production in Uganda, but there are obstacles in the way. The central area of the country, with its 55–60-in. annual rainfall, is ideal for sugar-cane, but most of this land is already being cultivated by African peasant farmers and the land laws forbid a non-African to buy African land. The Governor's consent has to be obtained even to lease it. Efforts have been made to interest farmers with land near the existing sugar estates to join cane farming schemes, selling their cane to the factory. But they can earn more with less trouble by growing coffee, so cane farming has languished.

A British firm which examined the area agreed that sugar could be grown successfully there, but it would require a capital outlay of some £6 million. This is a lot of money to invest in a country which is moving towards self-government and whose political future is, therefore, somewhat uncertain. Another deterrent is that the projected estates would be just outside the Queen Elizabeth National Game Park and the task of protecting the sugar-cane from sweet-toothed elephants, buffaloes and other animals would be formidable. So the project has fallen through.

Increase in yields

It seems, therefore, that any further increase in production has to come from the existing estates. On this there is a division of opinion. ' There is a limit to intensive and mechanical cultivation and it has nearly been reached', say the estate owners. ' With a little more financial outlay, care and common sense the yield per acre could be increased 50% ', is the view of the Agricultural Department. ' The estates are yielding not more than two tons of prepared sugar per acre per annum, whereas three tons is possible. More sugar per acre is a sounder solution to the problem than increasing the acreage under sugar '.

Increase by irrigation

It has been found that the yield increases by about one ton of cane per acre per crop for every 1 in. increase in annual rainfall. On the drier estates, which get between 30 and 40 in. of rain, irrigation would, therefore, be a great help. Here again there are political considerations. Under the Nile Waters Agreement between Egypt, Britain and the Sudan, Uganda cannot use the Nile, Lake Victoria, or the rivers which flow into it, for irrigation. Britain is seeking a new agreement giving East Africa a more equitable share of Nile waters and the sugar estates are already installing pilot irrigation schemes. These indicate that

Hundreds of miles of narrow-gauge line facilitate the bringing of cane to the factory

Although Uganda's sugar estates are the most highly mechanised agricultural project in East Africa, cutting is still done by hand

the crop yield could be increased by up to 60%, but whether full-scale irrigation will be an economic proposition is another matter.

Fertilisers

The use of fertilisers is also an open question, as the optimum pattern of fertilising Uganda soils has yet to be determined. The Agricultural Department is establishing a sugar research station where this problem will be given proper attention.

Plant disease

The Department is investigating ratoon stunting, a disease which first appeared in Queensland and with which the Uganda estates are now heavily infected. All imported cane varieties are now quarantined for two years to ensure that no new disease will be introduced.

Owing to the absence of exterior symptoms, except those which exactly simulate drought conditions, the estate owners only recently realised the existence of this disease. Now they are trying to clear it by soaking their planting material for an hour and a half in water at 52° C. If the operation is done with care, this kills the virus, but not the cane. A couple of degrees too cool and the virus will not die; a couple of degrees too hot and the cane will.

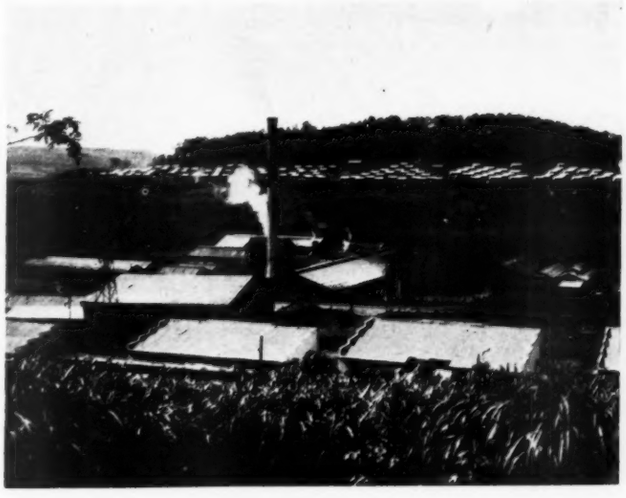
The risk of reinfection, too, is high. The disease can be spread by cutting healthy cane with the same knife that has been used to cut unhealthy cane. It might seem easy enough to sterilise the knives after each cut, but it is not so easy in practice to get complete compliance from African labourers. The eradication of this disease would raise Uganda's sugar production by nearly 25%.

Varieties

The size of the Uganda industry hardly warrants the cost of the breeding of new varieties, although no doubt a variety well suited to local conditions would boost yield.

All the varieties that are being planted have been bred within a few degrees of the Equator. This is because sugar-cane is sensitive to the length of day. Varieties bred far from the Equator are used to the long days of summer. When grown in an area which has 12 hours' daylight and 12 hours' darkness throughout the year they do not thrive.

This is probably the reason why Java varieties do well in Uganda. It is also the basis of an interesting experiment now being conducted at Muguga, the Kenya headquarters of the East African Agricultural and Forestry Research Organisation. An imported Australian strain is suffering badly from stunting and the Muguga officials were afraid that it was suffering from a disease. It has now been suggested that light-sensitivity was the explanation and experiments are being made to extend the Equatorial ' day ' by means of artificial light.



Lugazi sugar factory, one of the two main producers in Uganda. The 10,000-strong labour force is recruited from overpopulated up-country areas. The labour lines can be seen in the background

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Inch-Metric Problems

The problem of alignment of standards in the Commonwealth has taken on a new complexity with the adoption by India of the metric system and one of the important items on the agenda of the third Commonwealth Standards Conference, held early this year at Delhi, was a discussion on the consequences of this decision for intra-Commonwealth trade.

On the Indian side it was made clear that the formulation of standards in the metric system was a matter of great urgency. India is anxious, however, to adopt standards which are as far as possible in line with those of the inch-pound system and, in particular, will choose its international ' preferred ' numbers (on which are based ranges of sizes) as closely as possible in agreement with standards on the inch system. There is to be an urgent review of India's dimensional standards to decide which can be adapted by simple conversion from the inch to the metric values, those where inch and metric dimensions can be unified from the point of view of interchangeability and performance and those where they cannot be so unified. It was considered that the number of standards in the third category was comparatively limited, being confined to those products where highly accurate dimensioning was required.

New Tractor Testing Techniques

The object of farm trials is to provide an overall picture of the performance of the particular model of tractor undergoing trial when working on a selection of different types of farm for a reasonably extensive period of work.

The period of one year was chosen to provide an opportunity to observe a tractor's behaviour on all types of seasonal work, and it is also a sufficiently long period to give some indication of the reliability and rate of wear of the components.

Testing for operation in U.K.

The tractors used during the N.I.A.E. farm trials scheme are not tractors submitted by manufacturers; instead the tractors, usually about six of them, are chosen only after they have reached the farmer through normal trade channels.

One tractor is chosen for operation on each of six types of farm:

(1) Large arable farm including heavy land; (2) large arable light land farm; (3) mixed farm having only one tractor; (4) hilly arable farm; (5) sheep farm on steep hillside; and (6) market garden holding.

The various aspects of behaviour which are considered to be worth observing are:

(1) The time spent on each type of agricultural operation together with the fuel consumption and the rates of working; (2) the tractor's practical capabilities; (3) the engine performance of the tractor at the beginning and the end of the year's test period; (4) details of all breakdowns and repairs and the consequent loss in working time; (5) the condition of the engine at the end of test; and (6) the condition of any other components thought to need examining as a result of experience during test.

Once a tractor has done about 100 hours' work and is reasonably run-in, the normal service check is made by the agent—who is accompanied by an N.I.A.E. representative. Advantage is taken of this opportunity to make an inspection of the engine and various components.

Throughout the year's work details of each job undertaken by the tractor is recorded in a log book kept by the driver or farmer. Recording hour-meters are all fitted, and fuel used by the tractor is measured. Any loss in working time due to breakdown is noted in the final report, and immediately the breakdown occurs an N.I.A.E. representative visits the tractor while repairs are being made. Details of the farmer's maintenance of the tractors are also logged.

Testing for overseas operation

Before any test scheme designed to investigate the tractor's ability to operate satisfactorily under overseas conditions can be offered to the industry, the following stages must be completed:

(1) Decide which of the great variety of conditions cause troubles and difficulties in operation; (2) construct special facilities which will enable the conditions to be reproduced in the U.K.; (3) develop a practical test technique; (4) carry out tests to provide sufficient information for the performance of a new model to be correctly assessed.

Five factors in tractor operation not generally encountered in agricultural work in the U.K. immediately come to mind for consideration:

(1) Tractive ability under extremely muddy conditions such as encountered in wet cultivation of rice; (2) engine performance at high temperature and humidity; (3) life of mechanical components when working in extremely dusty conditions; (4) engine performance at high altitude; (5) engine starting characteristics under extremely cold conditions.

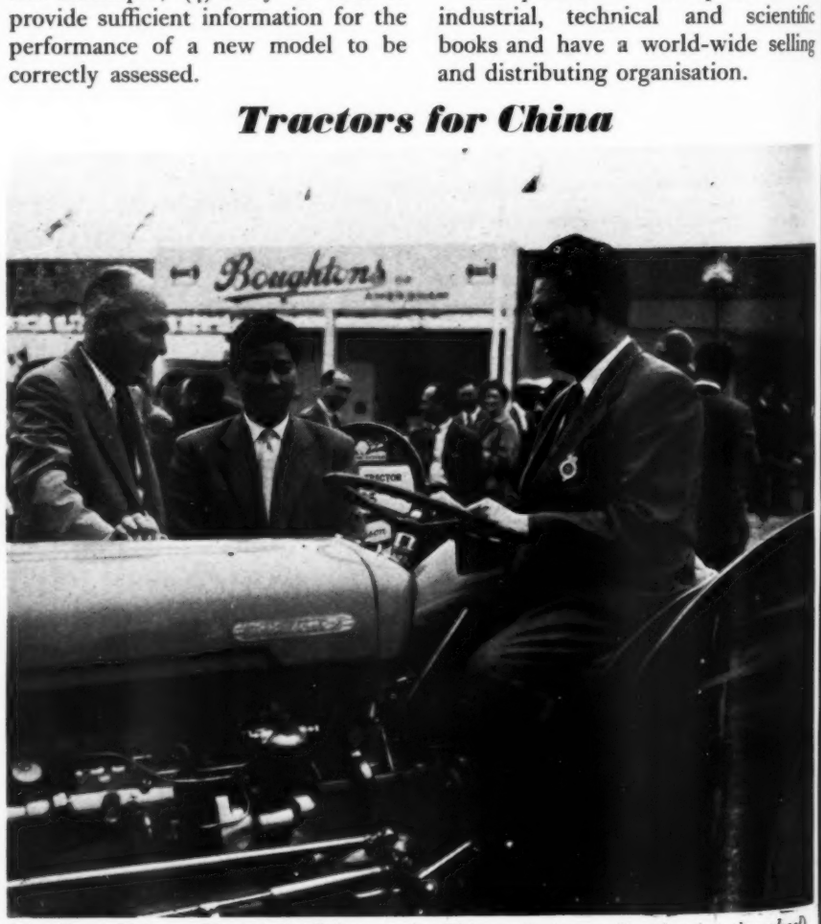
Abstracted from 'Recent Developments in Tractor Testing Techniques at the National Institute of Agricultural Engineering', by T. C. D. Manby.

To Authors and Readers

The publishers of WORLD CROPS invite the submission of manuscripts of books to be considered for publication. All manuscripts will be promptly acknowledged and carefully considered by qualified experts. A synopsis with chapter headings should be sent in the first instance, addressed to the Book Production Manager.

The publishers are specialists in industrial, technical and scientific books and have a world-wide selling and distributing organisation.

Tractors for China



Mr. Huan Hsiang, Chargé d'Affaires at the Chinese Embassy, London (at the wheel), and his Agricultural Attaché, Mr. Hsieh Shou-Tien, made a special visit to the British Royal Show. With them is the President of the Agricultural Engineers' Association, Mr. Lionel Harper

Parkland into Pasture

Winter wheat and barley growing in a Domesday deer park for the first time in over 900 years

Following an agreement between the Marquess of Abergavenny and the Ministry of Agriculture, work has been in progress since March this year to clear and convert approximately 800 acres of parkland in Sussex, England, into pasture. The first 100-acre block has already been cleared. This entailed bulldozing and blasting countless old tree stumps, removing slabs of rock, clearing thorn scrub, ploughing-in the bracken, and liming and correcting soil deficiencies. After having lain fallow during the summer, the cleared land is to be cropped with winter wheat.

A deer park since Domesday, the land was described by an 18th century writer as an assemblage of all nature's beauties—hills, vales, brooks, groves, thickets, rocks, waterfalls, all wildly noble and irregularly amiable. This is still true today. The reclamation programme will further enhance the natural scene for, after clearing and cropping with wheat, the land is destined to be seeded to grass which should be ready for stocking with cattle and sheep within two full years from the first ploughing.

All the mechanical work, with the exception of the initial bulldozing, is being undertaken with four Ferguson 35 tractors and their ancilliary equipment. As this scheme develops, a range of Massey-Harris and Ferguson equipment will eventually be used. All operations are to be carefully costed.

Each year a further block of from 150 to 200 acres is to be progressively reclaimed until the whole park has been covered, with the exception of 230 acres adjacent to Eridge Castle. This area is to be preserved and will continue to support the herds of red and fallow deer which now roam the park.

Agriculture thus benefits by the acquisition of a large parcel of land never previously cultivated. It is hoped that this may set a pattern which others may follow.

A Ferguson diesel tractor, equipped with a 16-in. deep digger plough turning the first furrow in Eridge park, March 1957. Note the tyre girdles, fitted with spade lugs for this very heavy work. Hidden tree stumps were removed with explosives

Ploughing on a steep hillside with a Massey-Harris-Ferguson tractor

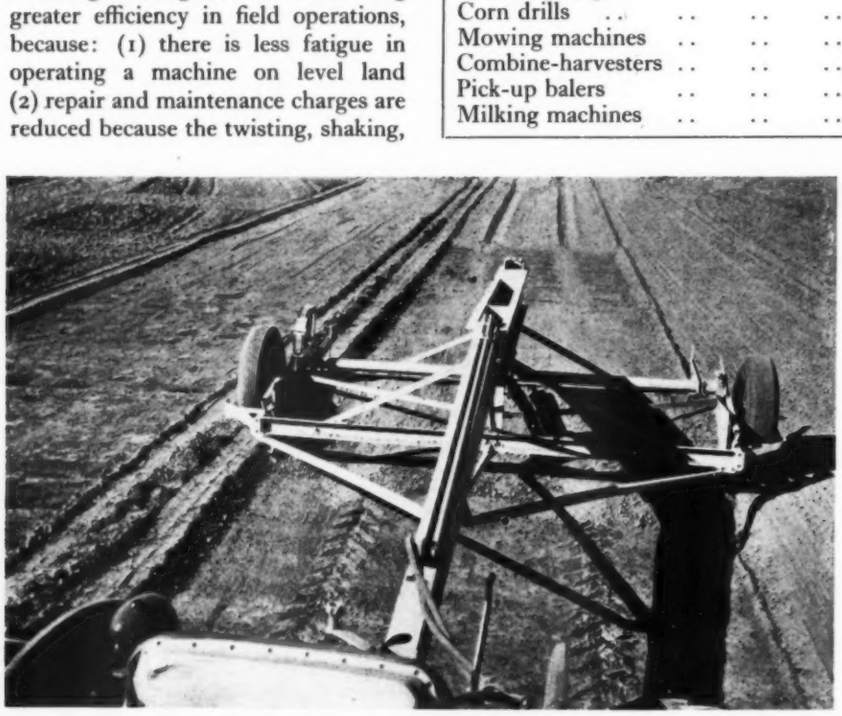
Land Smoothing

In spite of the tremendous strides that farm mechanisation have made during the last decade, very little attention has been paid to preparing land surfaces so that agricultural machinery can be operated with maximum efficiency.

In the development of the motor-car, highway improvement has more or less kept pace with the increasing elaboration of the machine, but in agriculture, complicated and elaborate machines such as the combine-harvester, seeding machine and thinners are asked to work efficiently on field surfaces which were good enough for horses and other draught animals drawing their simple implements but which are not up to modern requirements.

Land smoothing and levelling are, of course, primarily to secure effective irrigation with less water, to eliminate high and low spots and to obtain accurate control of the water table. It is well known that crops are drowned or retarded in water-logged low areas and are under-developed in the drier high spots.

Land smoothing, however, is also necessary for other reasons for precision smoothing is now considered to be one of the most effective ways of reducing farming costs and obtaining greater efficiency in field operations, because: (1) there is less fatigue in operating a machine on level land (2) repair and maintenance charges are reduced because the twisting, shaking, pounding and bumping of the machine is eliminated; (3) greater uniformity and accuracy is possible, both in line and in depth operations; (4) output can be increased because higher speeds and wider machines can be used; (5) thinning can be so effectively carried out that more rows can be done in one operation; (6) wheat stalks are of more uniform length and the crop will be more uniformly ripe so that combine-harvesting can be carried out with precision.



The Eversman '329' being operated as an open-bottom hydraulic scraper and filling up low spots with dirt

Agricultural Machinery in Britain

Farm output in the U.K. today is almost 60% greater than pre-war, although the number of workers employed is no greater than it was in 1939. In the same period, the export of agricultural machinery has increased by 500%. Three out of every five of the machines produced is exported.

The number of tractors on holdings in the U.K. has increased tenfold since 1939, and the number of farm horses has been cut to one-fifth. Expenditure on machinery operation reached the record figure of £198,500,000 in 1956-1957—a ninefold increase on 1937-38. when it was £22,500,000.

The capital cost of mechanising a farm today ranges from about £40 an acre or more for basic equipment on a 50-acre holding to £15 an acre or more on 1,000 acres.

At what point the economic limit is reached and mechanisation ceases to pay depends entirely on the circumstances and potential of the farm. A safe estimate is probably £25 an acre, at which level most farms under 100 acres, and some even larger, are probably well advised to fall back on a contractor for their operational needs.

Machinery on Farms—England and Wales

Selected Items	1956†	1954	1946	1942
All tractors	426,300	392,709	179,846	101,505
Tractor ploughs ..	287,440	284,954	155,582	97,174
Mowing machines ..	191,990	214,846	199,182	190,194
Milking machines ..	—	90,736	40,359	23,856
Combine-harvesters ..	31,020	21,117	3,253	*
Potato diggers (excluding spinners).. ..	*	9,999	3,774	*
Grain and grass driers ..	8,920	4,793	1,230	*

Farm Machinery Production in the U.K.

Selected Items	1956	1946	1938
Agricultural tractors	111,135	28,796	10,029
Horticultural tractors	27,770	18,250	650
Tractor ploughs	19,534	18,305	5,156
Corn drills	2,993	3,254	352
Mowing machines	19,967	9,338	4,641
Combine-harvesters	5,404	125	None
Pick-up balers	8,025	104	None
Milking machines	10,005	6,014	*

*Not available

†Based on one-third samples and subject to a small degree of error

(Based on M.A.F.F. statistics)

NEW PUBLICATIONS

The World Fertiliser Economy

By Mirko Lamer. Pp. 715. California: Stanford University Press. 1957. 100s.

Let it be said from the start that this book is a major contribution to fertiliser literature. It is one of the Stanford University's Food Research Institute series of studies on the theme of food and agriculture. The period surveyed—just before, during and after the second world war—is, of course, a little easier than any previous period of the fertiliser age, for with systems of control in most countries much more 'statistical book-keeping' took place, but in grasping this opportunity Dr. Lamer has been so admirably exhaustive. His knowledge of the Russian language and Russian economics has also enabled him to include a substantial amount of material on U.S.S.R. fertiliser use; unlike other post-war surveys on fertilisers, this book does not leave a gap about the Soviet under the heading 'data unavailable'.

A book that is at least 375,000 words long with in addition, 50 pages of statistical appendices, is neither armchair nor bedside reading, especially when almost all the text must be based upon technical or economic data. Essentially such a book is a work of reference but again Dr. Lamer deserves the highest praise for making his prose so readable.

The level of accuracy is high but well-informed readers may perhaps be able to find a minor error here or there. For example, in one chapter (p. 229) it is said that Imperial Chemical Industries Ltd. was 'the centre of all nitrogen production in the U.K.' during the war. The British reader will know that a substantial tonnage of gasworks and cokeworks sulphate of ammonia was steadily produced as it still is. But errors of interpretation of this kind are faults that fade into triviality when set against Dr. Lamer's gigantic achievement.

The unique chapter on fertilisers in the Soviet Union will no doubt be the 'chef's special' for all Western readers. It shows that, although great progress has been made in building an industry, almost non-existent before the Revolution, much still remains to be done to raise fertiliser production and fertiliser use to the better Western standards. 1954 production was double that of 1938, but it provided less than enough for crops scheduled to be fertilised, and therefore no surplus for use on other crops, such as grain and staple foods. Dr. Lamer concludes that it will be many years before production and requirements in the U.S.S.R. are in balance. As for the Western world, much attention is paid to pre-war trade agreements and to post-war policies on trusts and cartels.

No book even slightly resembling this has ever been written before. The late A. N. Gray's pre-war book, 'Phosphates and Superphosphates', is probably the nearest, but this was limited to one plant food and it had a strong 'trade' angle. One doubts whether another book like Dr. Lamer's will arrive in the next decade or so. His dedication—'to the tillers of soil among whom the author was born and raised; to the peasants of Croatian Zagorje'—can also serve as the most fitting finale to this deservedly enthusiastic review.

D. P. HOPKINS

Principles of Agronomy

By V. T. Subbiah Mudaliar. Pp. 440. India: The Bangalore Printing and Publishing Co. Ltd. 1956. 35s.

This book is primarily intended for the use of students of agriculture, and it covers the syallabus prescribed by the Universities of South India. The author was Professor at the Agricultural College, Coimbatore, now retired, and the notes and jottings made over the past 30 years have formed the basis of his treatment of the subject.

The general principles of agronomy are dealt with under four heads, soil, tillage, irrigation and manures. The work ends with two very adequate and straightforward appendices, one on agricultural meteorology, and the other on agricultural experiments and the statistical interpretation of their results.

This is a valuable text-book and although it presents the subject against a background of conditions in South India, experience and experiment in Europe, America and other parts of India are freely instanced, so that, as a book of reference, the volume has much to recommend it. There is a wealth of statistical data which amply supports conclusions, although the pages are not overburdened with tables. There are many maps, diagrams and apposite illustrations.

The discussion on tillage is particularly well-reasoned with nicely-balanced conclusions, as are also the observations on mulching. Methods of sowing and harvesting in India are checked up against those used in the west, and the subject of mechanisation in regard to Indian conditions is similarly closely examined.

Plantation procedure in the tea, coffee and rubber estates of South India is not described and this is a pity, because much can be learnt from them in spite of the fact that these perennial crops are grown under heavy shade as opposed to the working of annual crops on a sun-baked soil.

Agriculturally, India is the most backward large country in the world, judged from the point of view of out-turn per acre. Thus, the average crop of rough rice is only 1,100 lb. per acre, which is half the average in China and one-third that in Japan. Australia has averaged 5,500 lb. per acre, although admittedly this is on a small, irrigated area. The low out-turn in India is in part due to the vagaries of the monsoon rainfall, but other adverse factors include the lack of fertilisers and the poor variety of seed planted. *Then there is the fantastic host of useless cattle which wander everywhere seeking fodder. These are a steady drain on soil fertility and a prime factor in reducing the standard of living of the people.* Sentiment and religion enter into this difficult subject which is but briefly mentioned in the chapter on farm mechanisation. It is such an important problem that outspoken discussion is certainly called for in any book dealing with agronomy in India.

The language employed throughout the volume is clear and the style makes pleasant reading. The author is to be congratulated on this timely publication.

C. R. HARLER

E.C.E.

Reports in the 'Agricultural Mechanisation' series bring together technical information available in member countries on specific subjects.

No. 5 deals with the mechanisation of dairy farms and is prepared by Mr.

M. I. Stepanov, of the Ministry of Agriculture in Moscow. Price 2*s.*, $0.30 or 1.25 Sw. fr.

No. 6 is entitled 'The Harvesting and Storage of the More Common Cereals' and is prepared by Mr. M. Causcher, of the French National Rentre for Agricultural Mechanisation. Price 3*s.* 6*d.*, $0.50 or 2.00 Sw. fr.

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FAO Publications

The *Report of the First Meeting of the European Contact Group on the Uses of Isotopes and Radiation in Agricultural Research*, held in Wageningen, The Netherlands, last December, has now been published.

The new research techniques made possible by the use of radioisotopes and radiation are not as yet practised in all European countries. The Contact Group was formed with the object of extending the use of these techniques in Europe and exchanging information on the subject. The discussions at its first meeting were organised under five headings: uses of isotopes in soil, in plant, and in animal science, and uses of radiation in plant breeding, and uses in food preservation and processing.

It is to be hoped that the Institute for the Application of Atomic Energy, which is to be established at Wageningen as a centre of research, instruction and information, will in due course become a European rather than a national centre.

Fishermen's Organisations and the Regulation of Fish Prices in Sweden. This paper has been written in such a way that fisheries administrators and fishermen in other countries may profit from the experiences gained in Sweden. Price 5*s.* or $1.00.

General Principles Governing the Use of Food Additives is the report of the first session of the joint FAO/WHO Expert Committee on Food Additives held last December. Price 1*s.* 6*d.* or $0.30.

Crop and Livestock Insurance, report of the Working Party held in Thailand from 27 August–7 September, 1956. The Working Party considered the need of crop insurance for countries of Asia and the Far East, the problems involved in implementing such a scheme and the type of crop insurance suited to under-developed countries. The various documents submitted are not included, but are available from FAO. Price of the report, $0.50 or 2*s.* 6*d.*

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Rice Trade Glossary. This glossary of rice terms used in world trade gives equivalents in English, French, Spanish, Dutch, German and Italian for 65 terms, together with a list in English, French and Spanish of the definitions of rice terms adopted by the Group of Experts on Rice Grading and Standardisation of the FAO Consultative Sub-Committee on the Economic Aspects of Rice.

*

Empire Cotton Growing Corporation

The Annual Report for the year ended 31 March, 1957, states that a further record in production was established during the 1955–56 season, with individual record crops having been harvested in the Sudan, Tanganyika and Aden. Total cotton production since the end of the war has nearly doubled. The production figures demonstrate the success of propaganda based on the research and experimental work carried out by the Corporation. The effect of the new strains selected or developed since the war is now beginning to be felt.

*

Maize in West Africa

We have received a copy of the second Annual Report of the West African Maize Research Unit, which covers the year 1954. The results of yield trials have been published separately. Reports are included on greenhouse studies on resistance to *Puccinia polysora*, the incidence of fungal diseases on established and newly introduced breeding lines, a preliminary report on the occurrence of *Helminthosporium turcicum* Pass. in West Africa and a first report on the use of an automatic volumetric spore trap in the study of *Puccinia polysora* on maize.

Alabama Polytechnic Institute

Leaflet No. 52, 'Building a Pole Barn', gives detailed instructions, based on the Experiment Station's design research, on each step in the construction of a pole barn.

Leaflet No. 53, 'Peanut Hay for Milking Cows', is a report on experiments carried out to determine the value of groundnut hay for milk production and to discover the effects of grinding and molassifying groundnut hay on the amount of hay wasted and on milk production.

*

Potato and Tomato Yearbooks

The 1957 edition once again contains much useful information for the potato industry, particularly in North America, together with a list of recent literature references to potato cultivation, U.S. standards and much statistical information. The onion supplement has been expanded and revised.

The American Tomato Yearbook follows roughly the same pattern and performs the same service for all interested in the tomato industry.

Both are published by C. S. Macfarland, New Jersey, price $2.00.

*

EPPO Publications

'Colorado Beetle, *Leptinotarsa decemlineata* Say, in Europe in 1956'. A general appraisement of the situation in 1956 is followed by a summary of the position in each country. Due largely to weather conditions unfavourable to the beetle, the intensity of infestation was less than in the previous year.

'Potato Root Eelworm, *Heterodera rostochiensis* Woll., in Europe and the Mediterranean Basin in 1956'. Here again a general appraisement is followed by a summary of the position in each country. Attention is drawn to a seed potato washing process developed on a farm in Scotland the adoption of which might provide an excellent safeguard against the spread of eelworm. Price 1*s.* or 50 F. fr.

'Potato Wart Disease, *Synchytrium endobioticum* (Schlib.) Perc., in Europe and the Mediterranean Basin in 1956' follows the same pattern and stresses that the problem of this disease is by no means yet solved. Price 1*s.* or 50 F. fr.

MACHINERY AND EQUIPMENT

For Mulching and Silage

The Wilder - Rainthorpe ' Multi-Masta ' chopper provides a quick and easy means for the disposal of straw, clearing potato haulm and chopping vegetable stalks and waste after cropping.

It is ideal for farmers who do not wish to bale their straw. The machine picks up the swath of straw left by the combine, chops and bruises it and spreads it back on the ground evenly and over the original width of cut of the combine. The chopped straw will decompose more quickly, plough in easily and will not harm an undersown ley.

The machine is driven by the tractor p.t.-o. In action, two rows of fast-moving flexibly-mounted chopping blades lift the swath of straw and carry it between two rows of fixed knives, where the straw is thoroughly bruised and cut before being dispersed by the deflector plates.

The machine will also clear ground of bracken. It will mow and pulverise short bracken only 6 in. high as well as bracken 5 ft. high.

Kale stalks, brussels stalks, cocksfoot stubble and other vegetation can all be cleared quickly and easily by this useful machine.

By substituting a light but strong fibreglass silage delivery chute for the standard deflector tray the machine can be used for the production of silage in a pit or clamp.

Reader Service

For further information on any item of machinery or equipment reviewed in this issue please write to:

Reader Service,
WORLD CROPS,
Stratford House,
Eden Street, London N.W.1,
England

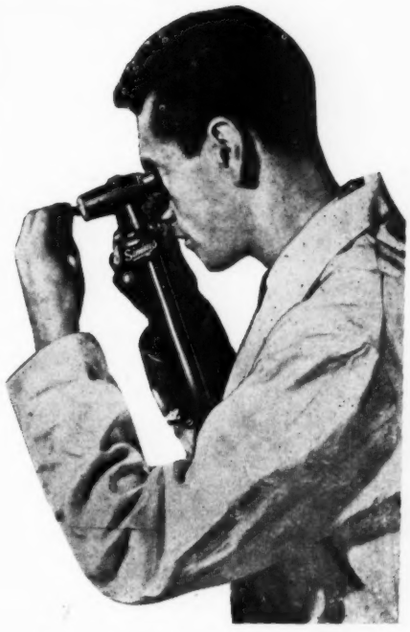
The ' Sila-Masta ', as it is called, will mow, chop and deliver into any trailer drawn behind, all silage crops including kale.

The crop is chopped and bruised by its passage through the ' Sila-Masta ', leaving it in a form ideal for silage. An applicator for silage accelerators, such as ' Silotex ', can be fitted.

Any two- or four-wheeled trailer can be adapted for use with this machine. The sides and back must be sheeted or wire-netted up to at least 8 ft. from the ground and the top should have a wire-netting cover. The crop is delivered through an opening in the front of the trailer. A tractor of 35 h.p. upwards is recommended.

Where the silage is being made at a central point, two or three trailers may be used. A ferry tractor can collect loaded trailers from the field, empty them and return them, while the 'Sila-Masta' picks up an empty trailer and loads it ready for the ferry tractor to collect.

The ' Sila-Masta ' at work on a field of kale. It will be seen that the field is left in a very clean condition



Inspecting a diesel injector nozzle

For Inspecting and Testing Nozzles

The Simms nozzlescope is a precision instrument for the inspection of diesel injector nozzles and needle sets, which provides the operator with a clear, magnified and well-illuminated view, revealing scoring and other damage quite distinctly. It is illuminated by a special lens bulb, suitable either for mains supply (220-250 v. a.c.) or for operation with dry cells.

They also manufacture a nozzle tester for injectors fitted to automotive or other high-speed diesel engines. It consists of an oil pump and a pressure gauge with a dual scale, graduated in lb. per sq. in. and in atmospheres.

Gunning for Weeds

A flame-gun can best be described as a very large blowlamp with a special hood over the flame to concentrate the heat and prevent the heat from spreading. What a flame-gun will destroy and how long it will take to do it depends on the depth, density and moisture content of the weeds and undergrowth. It is obviously asking a lot for a flame to dehydrate and burn simultaneously a mixed mat of wet weeds and grass.

The fierce heat of the 30-in. flame (2,000°F) of the McAllan flame machine is applied at the right angle for effective flame distribution and at the

right height to ensure heat concentration, so that wet vegetation and the seeds of noxious weeds are totally destroyed, together with insects, and their eggs and grubs, and also any disease spores and bacteria which may be present on the surface of the soil. The special hood so confines the heat that the machine may safely be walked between greenhouses, rows of cloches and growing crops, such as soft fruits and bushes. A simple adjustment raises or lowers the flame-gun on its wheeled chassis; this allows the flames and the hood to be set at the most effective height, according to the nature of the bed of weeds or the texture of the soil.

There are four models, two which are simple flame-guns and two which are mounted on wheels and hooded. The Mk. 12 hooded model weighs only 35 lb. when loaded with fuel. Fuel consumption is about 1 gal. paraffin per hour.

Here are a few of the uses to which this implement may be put: to burn rubbish; to clear an overgrown hedge bottom or ditch; to weed round cold frames or glasshouses or beds of growing crops; to remove weeds from awkward places, *e.g.* on concrete or round stacks of bricks; to clean up paths, drives and railway tracks; to make firebreaks in heathland or forest or round plantations; to sterilise soil, seedbed, infected land, pigsties, poultry houses, stables, garbage or sewage; to burn up *seeds* as well as weeds, disease-carrying prunings and pestilential growths, such as ivy and bracken; and, finally, to destroy harmful forms of insect life and diseased carcases.

The ' J.C.B.' excavator will provide a ditch, 5 ft. across the top and 1 ft. 6 in. across the bottom, and approximately 3 ft. deep

For Cutting and Cleaning Drains

The ' J.C.B.' excavator, made by J. C. Bamford (Excavators) Ltd., is an implement mounted on the rear of a ' J.C.B.' unit, powered by a Fordson high-speed diesel engine. Five hydraulic rams are employed: one to raise and lower the frame, one to slew the digger, a third to raise and lower the boom; the fourth, the digging ram, draws the bucket in towards the machine and the fifth ' crowds ' the bucket after it has filled.

The machine can dig at a distance of 17 ft. anywhere within a radius of 180°. It is thus able to dig a ditch within inches of a hedge or fence and yet dispose of the spoil well away from the ditch.

The operator can ' feel ' with the cutting edge of the bucket and so can provide a fall which will ensure the smooth flow of water without any ' pooling '.

The curved ditch-cleaning blade is designed to work at right angles to the machine. It cleans 5 ft. of ditch at a bite and from 1 to 2 chains an hour. It cuts and clears undergrowth, weeds, roots and other obstructions and can either load these immediately for carting away or it can deposit them on either side, well clear of the ditch. The blade is drilled at the ends to allow the water to escape and, like the bucket, its cut can be so adjusted by ' feel ' that an uninterrupted flow is maintained in the ditch.

The tractor moves parallel with the ditch and can be driven from site to site whilst carrying either bucket or blade at about 14 m.p.h. It carries 14in. x 30in. rear wheels and tyres as standard and is therefore able to operate under wet and sticky conditions, such as are found in paddy fields.

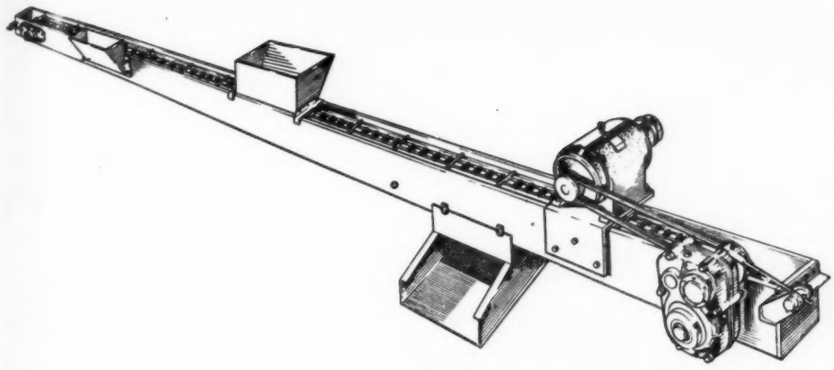
The Mk. 12 McAllan hooded flame-gun

Machines for Sugar Beet

Three British agricultural implement manufacturers have recently begun an interesting experiment in industrial co-operation. Each of the firms make machines which are used in the various stages of sugar-beet cultivation.

S. Berendsen Ltd., London, who export on behalf of Stanhay (Ashford) Ltd., manufacturers of precision seeders, S. K. H. & Son (Salopian-Kenneth Hudson & Son) of the Owen Organisation, who market Hudson down-the-row thinners, and Catchpole Engineering Co. Ltd., manufacturers of beet harvesters, are working together with a view to promoting sales in overseas countries.

The object is to present the whole concept of sugar-beet mechanisation in an attractive and comprehensive way and to encourage dealers and growers to consider mechanisation from the preparation of the seedbed to the harvesting of the beet.



The ' Whitlock ' chain conveyor is vibrationless in operation and its power requirements are low

Grain Handling Equipment

Messrs. Whitlock Bros. Ltd. have been manufacturing grain-handling equipment for many years and are able to offer a wide range of elevators and conveyors designed to meet all problems in the movement of grain, with capacities ranging from 2 to 24 tons per hour.

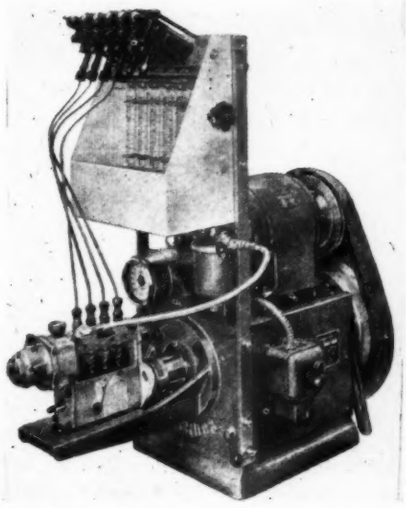
The most popular conveyor for use on farms is the horizontal chain conveyor, which is offered with a capacity of up to 12 tons per hour, or in a double-width version up to 24 tons per hour. These conveyors have a low power consumption and are very easily installed, even with unskilled labour.

The Whitlock chain conveyor is of extremely small dimensions, with a cross-section of only $6\frac{5}{8}$ in. x $7\frac{1}{8}$ in., enabling it to be installed in confined spaces without structural alterations to floors and buildings. The conveyor is made in all lengths, the power consumption being only $\frac{1}{2}$ h.p. for every 25 ft.

A New 2-litre Diesel Engine

A 4-cylinder 2-litre diesel engine of advanced design is now available for the 4-wheel-drive Land-Rover. Rover engineers have produced, after two years of research and development, a rugged diesel engine which develops 52 b.h.p. at 3,500 r.p.m. and shows a substantial fuel saving, thereby reducing running costs. The new diesel engine has a similar speed range to the Rover petrol engine in current use with the Land-Rover, thereby enabling the same transmission units to be used. A reduction in the maintenance costs, with a longer running period between overhauls, make the Land-Rover yet more suitable for working under tough conditions.

The new Rover diesel engine incorporates many up-to-date features. These include wet cylinder liners, easily removed and replaced during overhaul; a three-bearing counterbalanced crankshaft to suit the high compression of the engine; a camshaft with specially designed cams to obtain a high valve lift with a minimum of stress on the valve-operating gear; roller type tappets designed to obtain high valve lifts and consequent high accelerations for good engine breathing with the minimum of wear on the cams; Ricardo Comet V combustion chamber of exceptionally efficient design ensuring the highest possible degree of air utilisation.



The Hartridge ' Minor ' diesel fuel pump calibrator is really a simple and inexpensive test bench

A Fuel Pump Injection Calibrator

For the complete testing of diesel engine fuel injection pumps it is usual to use an elaborate and somewhat expensive fuel injection equipment test bench. While this has the merit of convenience and also makes it possible to carry out a complete range of tests, there has always been a need for a simpler and less costly outfit for testing and calibrating these pumps.

The Hartridge ' Minor ' diesel fuel pump calibrator has been produced to meet this need. This equipment will deal efficiently with all fuel injection

A Land-Rover, fitted with a Rover diesel engine, operating under tough conditions

pumps in the 'A' and 'AA' category, and 'B' up to 7.5-mm. plunger diameter.

The fuel injection pump to be tested is mounted on a bracket, and flange-mounted pumps are provided with base fixing holes. The injector mount is hinged to allow easy location of the pump without removing the pipes from the injectors. Fuel flow is controlled by an instantaneous trip mechanism, allowing 100 and multiples of 100 injections to be measured in accurately calibrated test tubes.

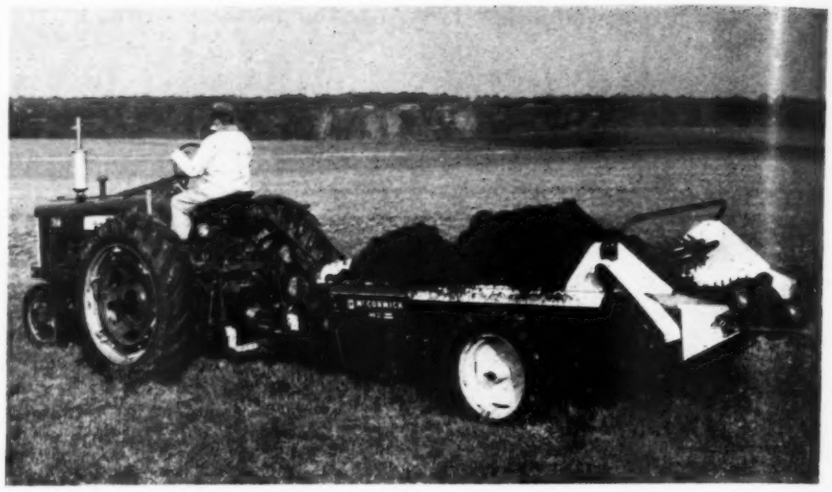
Centrifugal Pumps for Irrigation

There is a 'Floodmaster' pump to meet every requirement on the farm. There is the model B2 for irrigation and pumping screened liquid manure; there is the electrically-driven BIE model, which pumps up to 1,000 g.p.h.

A 'Floodmaster' pump operating a 512-ft. long sprayline in a market garden in England

and lifts up to 20 ft. and could thus provide a cheap main water supply; there is the model B1½ Mk. 11 with an output of 4,000 g.p.h. for lighter irrigation and watering duties, using spraylines and sprinklers; there is the B1½ Mk. 1 of the same capacity, which is particularly economical on fuel, as it can be operated on a petrol-paraffin mixture; and, finally, there is the small BI ¾-in. model for quick and economical washing down in the dairy.

The power units are either petrol or petrol-paraffin engines with air-cooling. In the pumps priming is entirely automatic, as the principle of internal water recirculation has been adopted to eliminate the necessity for a priming valve. At no time can the pump case empty itself, so that there is no need for constant supervision in case the water line should fall below the suction line.



The new low-slung McCormick International No. 21 manure spreader can carry 70 bushels of manure

For Peat Harvesting and Drainage

The 'Miniput' peat-cutting machine, manufactured by Johannes Flügger, is fully-automatic and can be operated by only two men. Its normal working speed is 120 ft./h. and it can cut and spread peat at an average of 5 tons of dry turf per hour, though naturally the actual output depends on the depth and moisture content of the bog, and the power of the engine.

One of these machines is operating on the Derrykinlough bog on the Sligo-Mayo border of Ireland to obtain peat fuel. A crew of five work with this machine, which is fitted with lights for night operation during spells of fine weather. The extra three men are for the removal of the peat.

The 'Miniput' is mounted on two caterpillar tracks and, when operating on small bogs, can be moved from site to site at a speed of one mile/h., both forward and in reverse. The machine can also be used to drain extensive areas of deep peat and can produce a vertical or a sloping cut-away, according to requirements. A spreader arm, 50 ft. in length, is provided to deposit the excavated material evenly over the land, and the depth of cut is 10 ft.

The standard model is powered by a Perkins' 4-cylinder industrial diesel engine, capable of producing 53 b.h.p. at 1,800 r.p.m. All gears are of ample size and are safeguarded against overload by shear-pins.

For Spreading Manure

International Harvester Export Co. has just announced a new 2-wheel ground-driven manure spreader with a 70-bushel capacity for use on medium-sized farms.

The new spreader, known as the McCormick International No. 21, is designed for the severest operating conditions. The sides of the spreader box have been reinforced and the steel flare around the top of the box is specially designed for hard wear and rough treatment through power loading and working at high speeds. Weight distribution is sound and gives maximum traction to both tractor and spreader wheels.

A 'Miniput' peat-cutting machine, powered by a Perkins L4 diesel engine, at work on an Irish bog

Other features of the new spreader include: five apron speeds, high-speed shredding cylinders with replaceable self-cleaning teeth, heavy-duty wide-spread, a positive drive that assures uniform shredding and spreading, and a design that causes manure to be spread in an even pattern close to the ground.

Conversion Linkage for Tractors

Standardisation has a high place on almost every farmer's list of wants, not only because it would help to reduce his capital expenditure, but also because it would put an end to irritating and costly delays, *e.g.* when work is brought to a standstill because implements designed for one make of tractor cannot be used on another.

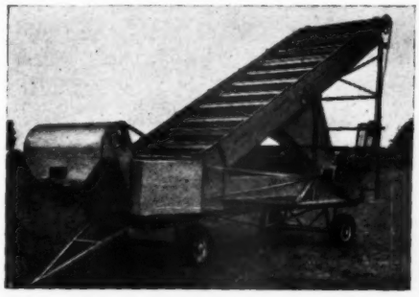
It is felt that the new conversion links, now being made by Lawrence Edwards & Co. (Engineers) Ltd. will be of considerable interest because they will make it possible to use either category one (Ferguson) or category two (Fordson) implements on the Ferguson tractor. The change-over can easily be effected in a matter of minutes.

As will be seen from the photograph (below) these conversion links are fitted in place of the standard lower links on the Ferguson; they are of similar dimensions, but are of much stronger construction to withstand the heavier load, and they have category two (Fordson) ball joints at the implement end. They are fitted and used in precisely the same way as the standard links and they are complete with the usual 1-in. pins and chains.

An important feature is that the ball joints are interchangeable; it is necessary merely to remove four socket screws in order to change the balls to revert to category one implements. Obviously it would be possible to revert to category one by changing the complete links, but it is much quicker to change the balls, which can be done in the field without use of any tools, except the Allen key provided.

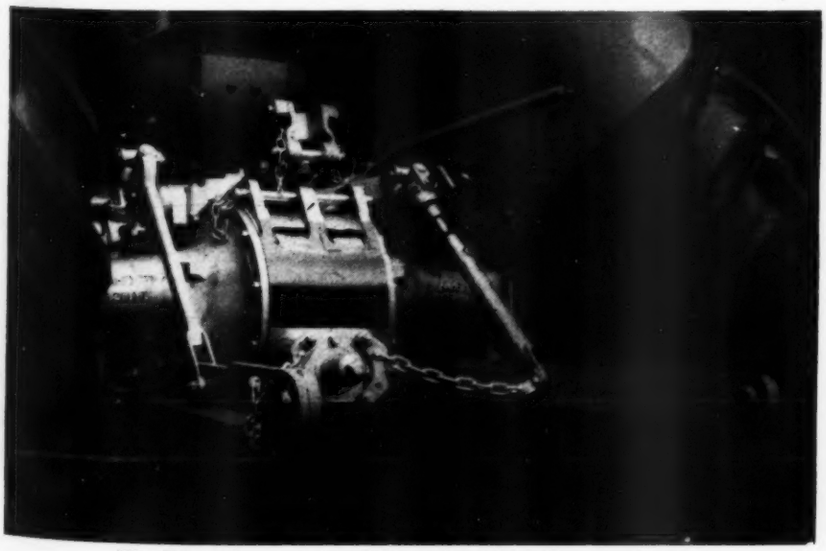
For Drying Grain

'Alvan Blanch' cascade grain driers are available in single units with an output of 15 cwt. per hour up to 1½ tons per hour, and these units can be arranged in batteries. The junior model will deal with the output of one combine and the standard model with that of two combines. Both can be mounted on a rubber-tyred chassis.



An ' Alvan Blanch ' cascade grain drier, mounted on wheels

The drier can be installed in any building allowing a minimum headroom of 12 ft. The length of the drier (excepting pit) is approximately 22 ft. A level floor and grain pit is all the preparation necessary.



The Edwards conversion linkage fitted to a Ferguson tractor

An Allman sprayer working in a hop-field in Hampshire

The bed of the drier is inclined and is composed of overlapping louvres. There are no perforated sheets to get clogged or to allow dust to enter the hot chamber, so that the risk of fire is eliminated. The downward draught of air from between the louvres clears away all dust and leaves the tray clean at the end of the drying operation.

The cascade being open to the atmosphere makes it unnecessary to empty the drier at night. The fire should be shut off for a short time before closing down. In the morning drying operations can be commenced almost immediately.

The output elevator is provided with a range of speeds which allows the output and moisture extraction to be controlled as desired.

The depth of the grain is controlled by the roller dams and is constant. As a cup of the output elevator dips out the grain, that on the tray slides down sufficiently to allow a compensatory amount of grain to fall into position for the next cup to dip up. The moving grain turns the roller dams and at the same time is itself turned, thus even drying takes place. The input elevator keeps the drier full.

A Hop Sprayer

E. Allman & Co. Ltd. have produced a low-volume sprayer for use in the hop fields.

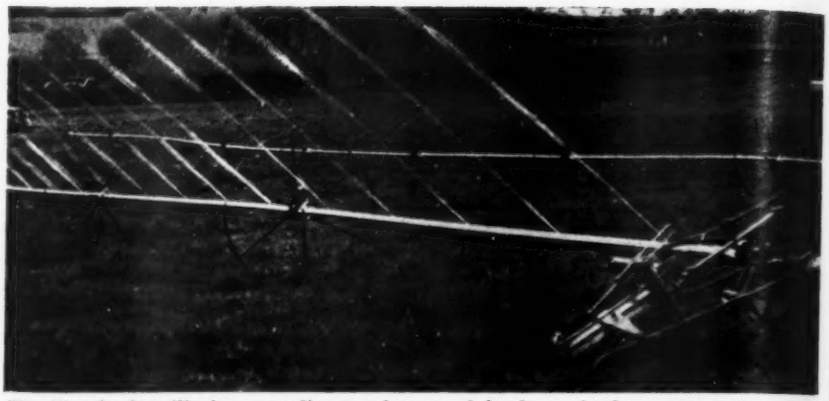
On this new hop sprayer there are no booms, effective cover being obtained instead by their ' Wideangle ' nozzles. The Allman 'Rollervane' pump is used to ensure even and accurate work. The machine is designed to fit on to the 3-point tractor linkage and it has a capacity of 60 gal. A self-filling attachment can be supplied.

A Free-rolling Sprayline

A *free-rolling* support for spraylines is a new feature in the U.K. Bomford Bros. Ltd. have produced a loose rolling stand which will permit the oscillation of the line, which is not possible when it is rigidly *fixed* to its supporting wheels.

The mode of operation is to rotate the rolling stand at one end of the line until the teeth at the other end of the line engage with the teeth of another line. The combined line may then be rolled in the direction in which the line has been turned. Lengths of up to 50 yd. may be rolled in this way; longer lengths of sprayline need to be broken up into 50-yd. sections before being moved to a new position, where they can be recoupled and reconnected to the oscillating unit.

Because of the high torsional strain, steel lines are used because it is doubtful whether alloy lines would stand the strain. Equally the all-welded construction with a square coupling is an advantage.



The Bomford oscillating sprayline can be moved freely on its loose supporting wheels

For the Agricultural Workshop

The governing factor in making farm machinery pay is to keep it working, on profitable work, for the maximum number of hours throughout the year. Running any machine at its maximum capacity, brings considerable problems in repair and maintenance because it is of vital importance that breakdowns must be put right and the equipment returned to service with the least possible delay. Many farmers rely on local agricultural engineers or blacksmiths for simple repairs and maintenance, but should these sources be full up with work, serious delays can occur.

To solve risks of this nature and reduce operating and repair costs, many farmers, today, have installed workshops on their farms.

The main work in such shops is the overhaul of tractors and farm implements, but, in addition, many conversions and modifications to standard machinery can be carried out. The selection of tools for use in this type of workshop is of course of great importance.

From the illustration however, it will be appreciated that many of the common jobs on the farm are remote from the workshop bench and a suitable power point. It is in situations such as this that the Wolf Portable Power Point proves to be one of the most useful accessories to have on a farm. This lightweight unit, carrying 100 yards of cable, avoids the inconvenience of having to drag heavy machinery up to the workshop for repair, and is an essential piece of equipment for repair work involving power tools within a 100 yd. radius of a power point.

Using a Wolf electric drill for repair work on an International pick-up baler

Mechanised Horticulture

Allen and Simmonds Ltd. introduce another advance in mechanised horticulture with their new Auto Culto ' Universal '. Designed to give really speedy and efficient ploughing, it ploughs to a depth of 7 to 8 in. and a width of 8 in. with ease. Its large 20-in. diameter low-pressure pneumatic wheels can traverse the most rugged and difficult terrain with ease, both when ploughing and when using the easily-attached grass-cutting bar. It is, in fact, a many-purpose machine with attachments for hoeing, cultivating, hedge-trimming, timber-cutting, hauling and edge-trimming.

Its front-hoeing attachment will particularly interest commercial growers, for on exhaustive tests with all types of crop and ground this has been proved to give easily the most efficient and manoeuvrable method of mechanical hoeing.

Powered by the Villiers Mk. 15 4-stroke engine giving 3 b.h.p. at 3,000 r.p.m., the ' Universal ' will meet the most exacting requirements.

This rugged machine would seem to be just the thing for the colonist in land settlement schemes and for small farmers in tropical countries who are at present handicapped by complete lack of mechanical aids.

The Ferguson paddy disk harrow at work in a ricefield in the tropics. The tractor is fitted with special cage wheels to give added traction and assist in puddling the land

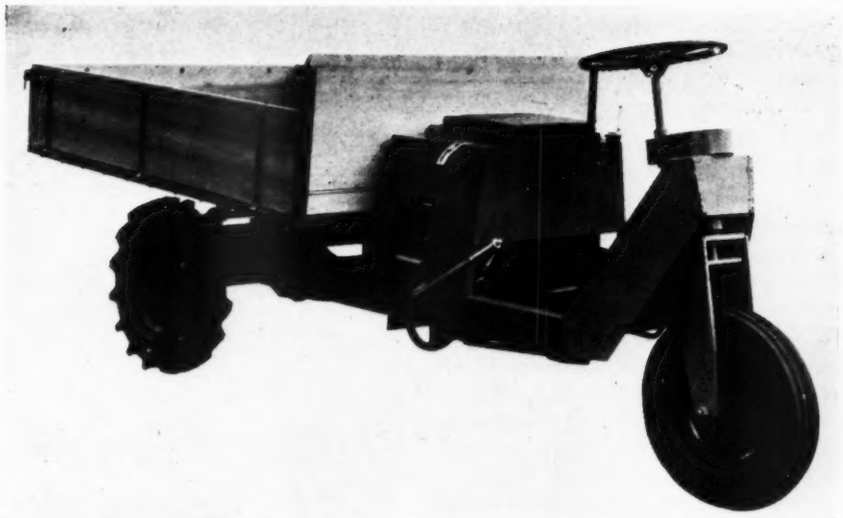
require certain modifications: (1) the normal brake shoes must be replaced by special shoes which function effectively, even under water; (2) a vertical exhaust is required, as the normal exhaust would be subject to excessive corrosion; (3) to prevent the possibility of water entering the clutch housing, the two holes under the housing should be enlarged, tapped and suitable brass plugs inserted; (4) front wheel weights are necessary, except with diesel-engined tractors, to improve steering and prevent the front wheels lifting when negotiating bunds with the implement raised; (5) a rocker extension must be fitted to the top link connection joint. By utilising this part the sensitivity of the depth control is greatly enhanced.

Publication No. 819039 M1 contains valuable advice on procedure.

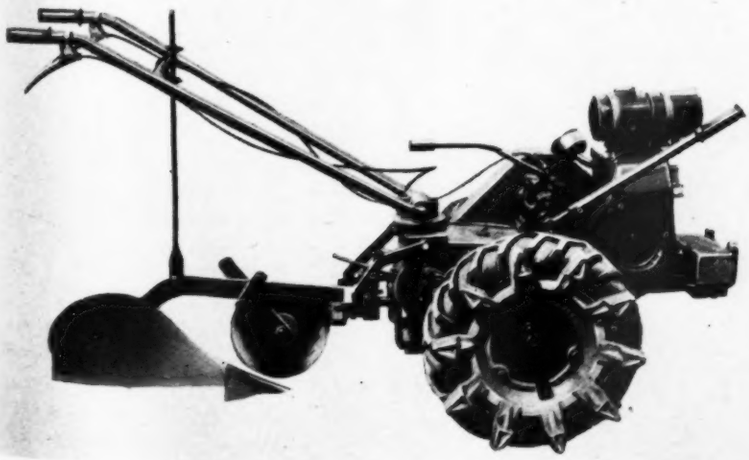
Wet Paddy Cultivation

The Ferguson system of wet paddy cultivation or puddling consists of utilising: (1) the standard Ferguson tractor slightly modified and fitted with certain additional accessories; (2) open steel cage extension wheels fitted in addition to the normal pneumatic tyres; (3) a specially designed lightweight implement to (*a*) open and partially invert the wet soil, allowing the water to enter and become intimately mixed, (*b*) cut and effectively bury trash and green manure and (*c*) leave a perfectly level surface after the operation.

Before being used for wet paddy cultivation the standard tractor will



The ' Bonser '—a useful truck for market garden, farm or estate



The new ' Auto-Culto ' universal cultivator is particularly suitable for market gardeners, small farmers and colonists in land settlement schemes overseas

A Farm Truck

The ' Bonser ' truck is driven by two rear driving wheels through a differential gear and is steered by a single front wheel. This arrangement gives excellent traction in soft ground and therefore a wide variety of uses on plantation, farm, market garden or smallholding. The driver is comfortably seated over the engine with the steering wheel and other controls conveniently placed.

It has a 5/6-h.p., 4-stroke, petrol-driven engine with three forward speeds and reverse and a top speed of approximately 12 m.p.h. The body is a manual tipper with a capacity of one ton. Its dimensions are 5 ft. 6 in. x 4 ft. wide x 1 ft. deep.

Agricultural Chemicals

Colloidal Copper

Copper is one of the oldest and most frequently used fungicides, which for dozens of years has been applied in the form of Bordeaux and Burgundy mixtures. These are good fungicides, but they have the disadvantage that the preparation of the spray liquid is rather cumbersome. Apart from these older fungicides, there are today other copper preparations, which can be made ready for use with greater facility, *e.g.* copper oxychloride wettable powder and copper oxydul wettable powder. These fungicides, too, have certain disadvantages since copper preparations are slightly phytotoxic and this often affects the yield and quality of the crop. Furthermore, with low-volume spraying, these preparations may clog up the nozzles.

Philips-Roxane have now developed a product which, while meeting all requirements, has been formulated in such a way that the disadvantages of the older copper preparations are eliminated. ' Duphar ' colloidal copper is a new liquid fungicide containing the copper in a finely-divided colloidal form, so that a much smaller quantity of copper per acre gives the same results as a more concentrated preparation. This reduces the risk of retarding growth through overdosage, in contrast with the effect of preparations like Bordeaux and Burgundy mixtures. The sticking capacity too improves with the size reduction of the particles, and in consequence the colloidal form of copper ensures more lasting results. Good sticking capacity is important because a copper spraying is a preventive measure, and a shower of rain should not wash the copper off the leaves. The size of the particles is important because the smaller the particles, the better the distribution and the greater the possibility of the spore of the fungus coming into contact with the copper as soon as it reaches the leaf.

This new fungicide has been tested in many countries and on different crops such as hops, grapes, apples, pears, plums, potatoes, bananas, tomatoes, tea and sugar-beet and its outstanding properties as a fungicide have been amply proved.

Fumigation of Planting Material

Trees, shrubs, bulbs, orchids and other plants are often subject to certification before inter-state shipment is permitted. ' Eston ' methyl bromide fumigation is the usual treatment specified to eliminate insects, nematodes or other susceptible pests contained in the soil around the roots or on the plant itself. Some of the most common pests involved are scale insects, mealybugs, nematodes, mites, weevil larvae, leaf miners, root aphids, bulb flies, Oriental fruit moth and various beetle larvae. Control of all stages throughout the soil is accomplished without injury to the plants where fumigation with methyl bromide is carried out according to specific dosages.

*

For Destroying Haulms

' Vitax ' haulm killer, a sodium and potassium arsenite formulation, destroys potato haulms and prevents blight developing later in the tubers. It is as satisfactory as sulphuric acid for haulm destruction and blight control, without the attendant risk of burning skin and clothes. It does not corrode the spraying machines. The correct dilution is 1 gal. to 70–100 gal. of water, applied at the rate of 100 gal. per acre. Low-volume spraying is not so effective. The product can also be used as a pre-emergence weedkiller on daffodil, narcissi and tulip beds.

Seeds and Supplies

Winter Feed

An acre of Cannell's kale costing from £18–£20 to grow and fold can replace purchased feed to the value of £65–£75, according to Cannell and Sons, root seed specialists. They introduced ' Marrow Stem ' kale in 1904 and their ' Thousand-headed ' kale in 1947. Kale is a plant that quickly 'runs back' and readily crosses with plants of related species, so it is essential only to use ' mother ' seed which gives true crops.

Their ' Marrow Stem ' kale produces the largest amount of nutritive matter per acre and its digestibility is superior to that of green oats, vetches, flowering lucerne and hay. Its mineral content includes satisfactory amounts of lime, phosphate, potash, sulphur, iron, magnesium and chlorine. It has a long-jointed, full, fleshy stem, with thin rind and plenty of leaf and, when young, all the leaves from top to bottom are available as food. The stems can be eaten, down to the ground, at all times.

' Marrow Stem ' Kale

The feeding value of Cannell's ' Thousand-headed ' kale is also very high; it is rich in protein, vitamins and minerals. It is composed almost entirely of leaves and is free from tough and indigestible stalk; thus it can be eaten right down to the ground. Its yield per acre is rather lower than with the ' Marrow Stem ' variety, but its feeding value is slightly higher. It is also hardier and has a greater resistance to damage by frost and snow. It is therefore a useful crop to follow the ' Marrow Stem ' kale until the spring grass is ready.

Cutting and carting is a costly business in time and labour and hand-feeding leaves much to guesswork. The cheapest way for winter milk production is to let the animals have free access to the standing crop of kale, or to control the areas daily by an electric fence or a single strand of barbed wire supported at plant top level.

WORLD CROP REPORTS

INTERNATIONAL REPORT

Hops

The world 1956–57 crop of hops, which includes crops harvested in the northern hemisphere in the late months of 1956 and in the southern hemisphere during the early months of 1957, amounted to approximately 126 million lb.

This is a reduction of 6% from the 135 million lb. harvested in 1955–56. *World production of hops has been declining steadily since* 1953 and the 1956–57 crop is 4% smaller than the average for the five years immediately preceding the war and materially smaller than the average for 1950–54.

The decline in the 1956–57 crop was due mainly to much smaller crops in the U.K., France, Belgium and Australia, and moderately smaller production in Czechoslovakia, Japan and New Zealand. The declines in these countries is attributed to unfavourable weather in one or more periods of the growing season or during harvest.

These reductions in output more than offset considerably larger crops in the U.S.A., West Germany and Yugoslavia. In the U.S.A. flood damage and unfavourable weather reduced production in California, but in Washington, Oregon and Idaho conditions were relatively favourable. The increases in production in West Germany and Yugoslavia are attributable to expansion in hops acreage.

REGIONAL REPORTS

Pakistan

The fourth estimate of the area under *cotton* for the year 1956–57 is 3,569,000 acres (American and Desi varieties—2,991,000 acres and 560,000 acres respectively), as against 3,537,000 acres (American and Desi varieties—2,956,000 acres and 581,000 acres respectively) reported in the corresponding estimate of the previous year, and shows an increase of 0.7%. The area under American type cottons increased by 1.2%, while there was a decline of 2.1% in acreage under Desi varieties.

The production of cotton for the year 1956–57 is estimated at 1,708,000 bales of 392 lb. each (American and Desi varieties—1,476,000 bales and 232,000 bales respectively), as against 1,670,000 bales (American and Desi varieties—1,446,000 bales and 224,000 bales respectively) reported in the corresponding estimate of the previous year, an increase of 2.3%. The increase in respect of American and Desi varieties is 2.1% and 3.6% respectively.

There has been an increase in the production of this crop in West Pakistan, which is attributed to favourable conditions during the period of the growth of the crop.

The area and production reported in the final estimate of 1955–56 was 3,537,000 acres and 1,738,000 bales respectively.

The second estimate of the area under *wheat* for the year 1956–57 is 11,774,000 acres, as against 11,178,000 acres reported in the corresponding estimate of the previous year, an increase of 5.3%.

The production of wheat for the year 1956–57 is estimated at 3,624,000 tons, as against 3,334,000 tons reported in the corresponding estimate of the previous year, an increase of 290,000 tons or 8.7%.

With the exception of Peshawar Division, there has been a general increase in the production of the crop in Pakistan. The increase is attributed to increased acreage and a favourable growing season. The general increase in acreage (again with the exception of Peshawar Division) is attributed to favourable weather conditions at the time of sowing and the ' Grow More Food ' campaign.

According to the fourth *rice* estimate for the year 1956–57, Pakistan will have 645,000 tons more rice this year than the previous year, although there is a decrease in the acreage by 1,165,000 acres.

The production of rice is estimated at 9,052,000 tons of cleaned rice, as against 8,407,000 tons reported in the corresponding estimates of the previous year. This shows an increase of 7.7% in rice production, which is attributed to favourable weather during the growing period.

The area under rice for the year 1956–57 is 22,445,000 acres, as against 23,610,000 acres reported in the corresponding estimate of the previous year, and shows a decrease of 4.9%. The decrease in West Pakistan is due to unfavourable weather conditions at the time of sowing in northern zone, and heavy and abnormal rains and floods at the time of sowing in southern zone. In East Pakistan, the decrease in acreage is due to damage caused by early flood.

Zanzibar

It is now certain that the 1957–58 seasonal *clove* crop will be a bumper. Clove crops for the past 10 years have been as follows:

Year	*Lakhs*	*Size*
1947–48	3	Small
1948–49	4	Small
1949–50	6	Medium
1950–51	12	Bumper
1951–52	3	Small
1952–53	2	Small
1953–54	13	Bumper
1954–55	5	Small
1955–56	7	Medium
1956–57	4	Small

Present indications suggest that the crop will ripen over a relatively short period instead of the usual progressive ripening from south to north. This will make picking more difficult.

Europe

The 1957 crop of *cherries* and *plums* in the OEEC area was slightly lower than last year (an average year) both as regards quality and quantity. This situation arises from the fact that in several countries frost in the late spring was harmful to the normal development in the blossoming period, whilst the persisting cold spell impeded the formation of the fruit by retarding the flow of sap.

The cherry crop in Italy was somewhat smaller than in the two previous years, but production in Germany and the U.K. was of the same order as last year. The French crop was fairly abundant, but the quantity suitable for marketing fresh was reduced because the weather had caused much of the fruit to burst. Other countries generally report a rather sharp fall in production, due chiefly to the alternation between good and bad crops and the late frost.

As regards *plums*, the Italian crop this year is expected to be much larger than in 1956 and probably above average. Germany and France forecast good crops of about the same order as last year. In the other countries, on the other hand, the plum crops are

expected to be well below those of the last few years, especially in the U.K., Belgium, the Netherlands and Switzerland.

The production of *peaches* and *apricots* has suffered less than cherries and plums. Consequently the 1957 crops of apricots and peaches for the OEEC area will be well above that of last year (a poor crop). The increase for the area as a whole will be about 50% in respect of apricots and about 10% for peaches.

As regards apricots, the Italian and French crops are excellent and the Austrian good, but the Swiss crop is expected to be small.

Peach crop prospects are excellent in France and Italy and very good in Greece. In Germany, on the other hand, the crop is expected to be well below average, despite a substantial increase over 1956. In the other peach-producing countries the crop is either average (Austria and the Netherlands) or smaller than in the preceding years (Belgium).

Tomato production in 1957 has not suffered from frost in the late spring or from cold weather. The bad weather conditions prevailing at present in some producing areas might, however, upset the crop forecast, which is now very favourable, including a 20% increase in the production of the OEEC area as compared with last year.

The Italian crop will probably increase, whereas those of France, Greece and the U.K. are expected to be of the same order as last year. A rise is expected in the crops of most of the other producing countries.

Despite the rise in tomato production in Italy, no important change is expected as regards exports or imports.

Lebanon

Wheat production in 1956 is estimated to have amounted to 70,000 tons, sufficient to supply nearly one-third of the country's requirements; 166,000 tons of wheat and flour was imported in 1956, as against 194,000 tons in 1955.

The *citrus* crop of 1956 is estimated at approximately 120,000 tons, of which 48,000 tons were exported; 26,000 tons to Syria, 5,000 tons to Czechoslovakia, 4,600 tons to U.S.S.R. and 4,000 tons to Jordan.

Estimates for the *apple* crop of 1956 put the production at 30,000 tons, of which some 16,000 tons were exported, entirely to other Arab countries.

Due to unfavourable climatic conditions, the *olive* crop in 1955 suffered severely and was deficient (10,000 tons). The 1956 crop, however, was abundant and produced 60,000 tons of olives. Of this, 10,000 tons served for local consumption and the remaining 50,000 tons was used for the production of 13,000 tons of oil.

Tobacco production in 1956 was in the region of 2.5 million kg., of which some 900,000 kg. was exported, mainly to Russia, Egypt, the U.S.A. and France.

This year the rains have been exceptionally good and there should be good yields of most crops, although the *wheat* crop is unlikely to be quite as large as it was last year. *Olives*, however, are an exception and, following their habit of biennial bearing, only a very small crop is expected after the bumper crop picked last year.

The market has been flooded during the last few months with seasonal vegetables of all kinds, but supplies are now becoming restricted. Lebanese agriculturalists are becoming worried over the disposal of their increasing quantities of fresh fruit and are looking round for new outlets to market some of their large surpluses. There are particularly large quantities of locally-grown *potatoes* on the market, mostly derived from seed imported from Holland of the Alpha and Bintje varieties. The traditional trade in Up-to-Date seed potatoes exported from the U.K. to the Middle East is being replaced by Dutch seed.

England and Wales

Cereal crops benefited from the rain during July but, except in the case of *wheat*, yields per acre are expected to be a little below the average of the preceding five years. Apart from some northern districts and upland areas haymaking was virtually finished; quality and condition are generally good. *Root* crops improved with the rain and yields per acre will probably be about average. Pastures also improved.

The weather during the first week of July was sunny and rather warm but with many thunder-storms. Cloudy weather with frequent rain and thunder-storms, and temperatures below average, followed and persisted until the last few days of the month, when brighter and warmer weather spread across the country. Rainfall was above average in almost all parts of the country, while sunshine and average temperatures were mostly below normal for the month.

Cereal and pulse crops.—Autumn-sown *wheat* looks well although some lodging has occurred. Spring wheat improved with the rain but many crops are still thin and backward. On the basis of crop conditions at the end of July the yield of wheat is forecast at 25.3 cwt. per acre as compared with a five-year average (1952–56) of 24.1 cwt. and a yield of 24.7 cwt. in 1956.

Barley has improved during the month and the harvesting of some autumn sown crops had begun. Some crops of spring barley are thin and uneven. Lodging has occurred in several areas. The yield is expected to be 22.1 cwt. per acre as compared with a five-year average of 22.6 cwt. and a yield of 23.8 cwt. in 1956.

Winter-sown *oats* are satisfactory generally and harvesting has begun in a few districts, but spring oats are thin in many areas. Mildew is frequently reported and there has been some danage by frit fly. The yield of oats is forecast at 19.4 cwt. per acre as compared with a five-year average of 20.3 cwt. and a yield of 19.1 cwt. in 1956.

Mixed corn is expected to yield 20.1 cwt. per acre as compared with a five-year average of 20.2 cwt. and a yield of 19.4 cwt. in 1956.

Rye is expected to yield 18.7 cwt. per acre as compared with a five-year average of 19.3 cwt. and a yield of 19.7 cwt. in 1956.

Beans for stockfeeding are a satisfactory crop; very little chocolate spot is reported but black fly have been troublesome in some areas. The yield is forecast at 17.4 cwt. per acre as compared with a five-year average of 17.2 cwt. and a yield of 17.3 cwt. in 1956.

Peas for stockfeeding are variable but improved with the rain. The yield is expected to be 15.2 cwt. per acre as compared with a five-year average of 13.8 cwt. and a yield of 11.7 cwt. in 1956.

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The item on England and Wales is abstracted from the monthly report of the Ministry of Agriculture, Fisheries and Food on agricultural conditions as at 1 August.